Surgery, Gynecology and Obstetrics

An International Journal
Published Monthly

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Volume IX
July-December, 1909

PUBLISHED BY
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1909

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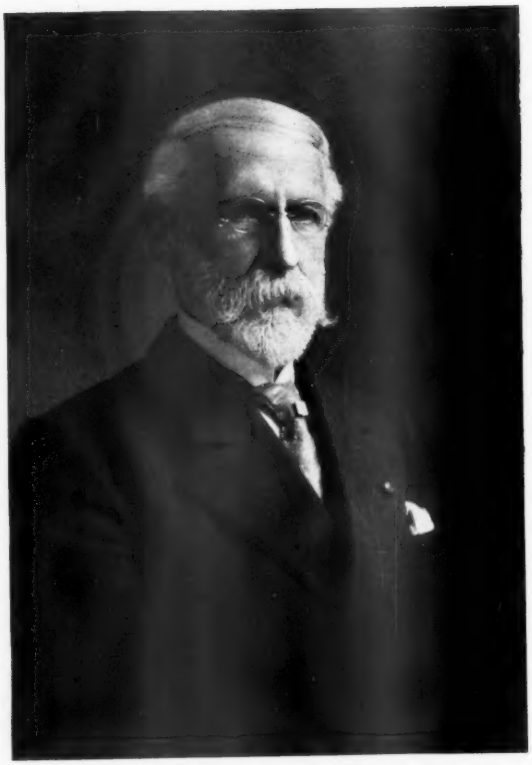

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SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME IX JULY, 1909 NUMBER 1

A METHOD OF COMBINING EXPLORATION AND DECOMPRESSION FOR CEREBRAL TUMORS WHICH PROVE TO BE INOPERABLE[1]

BY HARVEY CUSHING, M. D.

Associate Professor of Surgery, Johns Hopkins University, Baltimore, Maryland

IT is often impossible to judge from the neurological symptoms alone whether a growth, known to occupy one of the cerebral hemispheres, will prove to be accessible or suitable for surgical removal. Usually this cannot be determined until a thorough exposure and investigation of the cortex has been made. Hence, when reasonable uncertainty exists as to the operability of such a tumor one oftentimes hesitates to abandon a patient merely to the results of a subtemporal decompression, even though this simple palliative operation affords a large measure of relief in the great majority of cases.

Under circumstances, therefore, in which an exploration with an extensive exposure of the hemisphere seems justifiable, a temporary osteoplastic resection is doubtless the method of choice; but when such a resection has been made and an inoperable tumor or a tense brain without surface lesion is disclosed, there seems to be practically only one way to withdraw from the operative difficulties; namely, to leave the dura open and remove the bone-flap, closing scalp alone over the protruding hemisphere. Many operators, indeed, from the first make no attempt to preserve the bone in an exploration of this kind.

The abandonment of an operation in this fashion, however, often leads to ill consequences, for the cerebral protrusion under the protection of scalp alone may, through œdema, become so large as to jeopardize the solid union of the recent scalp wound, the parting of which is likely to be the forerunner of a fungus cerebri. This complication of a cranial wound should be rare under any circumstances and should never be the consequence of a simple exploration.

Another equally undesirable sequel of a cerebral hernia which happens to include the important central gyri — for this field is exposed in the larger number of such explorations — is the contralateral palsy which may result from injury of the pyramidal tract fibres as the direct outcome of an extensive protrusion with œdema in cases of great tension. It is to obviate such a complication that the chosen site for a premeditated simple decompression is over a silent area.

A further objection to the removal of the bone from an osteoplastic flap made directly over the seat of the lesion concerns the not infrequent rapid increase in size of a vascular growth owing to hæmorrhages in its substance; for some of the poorly supported, thin walled vessels may be ruptured during the change of position which occurs when the cortex protrudes through the open dura. Furthermore, even in the absence of any of these complications such a protrusion is unsightly and an uncomfortable thing for the patient to carry about.

To surmount some of these difficulties and

[1] Read before the American Surgical Association, June 3, 1909. For discussion of this and succeeding papers, see p. 97.

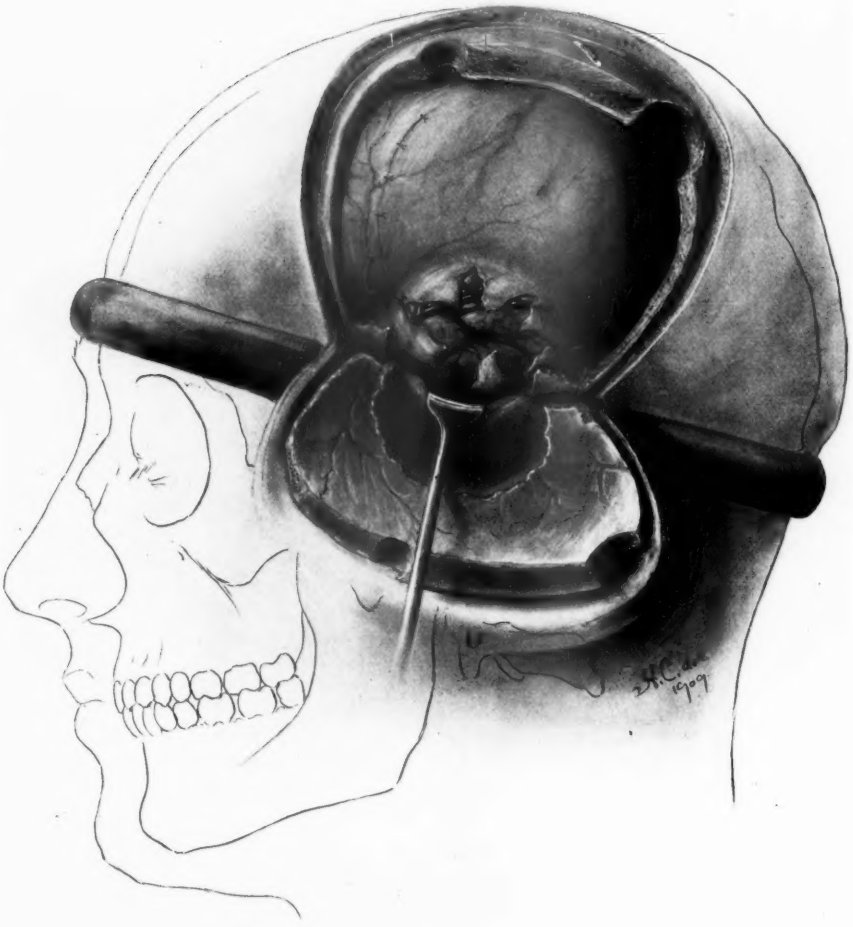

Fig. 1. To illustrate the method of combining a subtemporal decompression with an exploration of the hemisphere. Note: (1) Protrusion of temporal lobe through permanent dural opening destined to underlie bone defect after replacement of flap (dotted line indicates hidden area of bone rongeured away from side of skull while reflected edge of temporal muscle and tourniquet are held out by retractor). (2) Lines of partial closure of dura on its replacement following exposure of the hemisphere.

at the same time not only permit of a thorough exploration of the hemisphere with preservation of the bone-flap, but also obtain the advantages of a subtemporal decompression — in other words, to restrict the subsequent hernia largely to the relatively "mute" temporal lobe under the protection of the temporal muscle — we have resorted to the simple device, which may doubtless have occurred to others, of making the subtemporal defect after the bone-flap has been reflected.

The particular steps of the procedure may be briefly summarized. An osteoplastic resection, whatever tools may be employed, has doubtless come to be made, in the hands of all, under some form of tourniquet, with the omega-

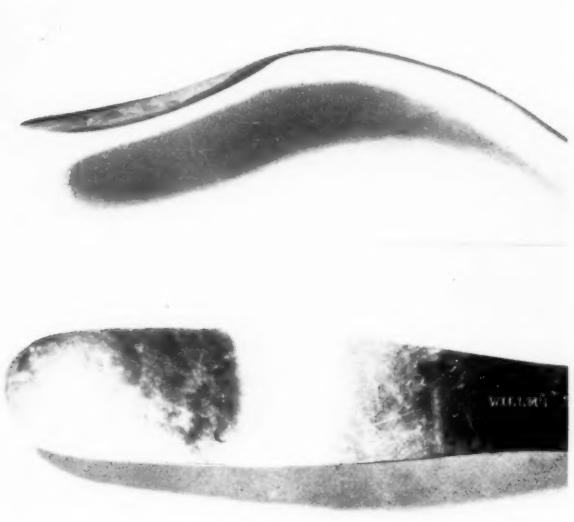

Fig. 2. Spoonshaped spatula: suitable for investigation of the cerebral surface beyond the marginal of the dural opening (slightly reduced).

shaped flap broken off across the thin squamous wing of the temporal bone. If the disclosed dura shows no evidence, through the transparent membrane, of a subjacent growth and proves to be so tense that caution speaks against opening it lest the pia-arachnoid become damaged and the cortex ruptured by a violent protrusion, a subtemporal area of bone is immediately removed as follows (cf. Fig. 1). From under the portion of temporal muscle which has been turned back with the flap, a roughly semicircular area of bone is cut away with heavy rongeurs, which remove bone without jar and so without risk of stripping the remainder of the resected bone from the soft parts. This accomplished, a similar area is rongeured away from the side of the skull well down into the temporal fossa under the tourniquet, the temporal muscle being held away by a retractor, as shown in the drawing. If the base of the bone-flap has been made sufficiently broad a margin possibly a centimeter in width can be left on each side as a support for the flap after its replacement. A subtemporal bone defect is thus secured with even less difficulty than is experienced in making the usual subtemporal opening from without through a split-muscle incision.

The dura is then carefully opened and incised in stellate fashion to the margins of what promises to be a sufficient circle of denuded cortex for a generous decompression. (*Cf.* Fig. 1.) In most cases of tumor the convolutions will be found flattened and the cortex so dry that very little cerebrospinal fluid can be evacuated, certainly not enough for its escape to greatly lessen the existing tension.

Further procedure may be abandoned at this stage and the flap replaced, but if it seems wise to temporarily reflect the dura in order to study the cortex of the hemisphere better than can be done through the transparent membrane, a lumbar puncture may be helpful at this period of the operation. There is always some danger of shutting off the circulation in a foraminal (foramen magnum) hernia by a lumbar puncture, though this is perhaps less in the case of a growth above than in one situated below the tentorium, and is still further lessened under the circumstances we are considering, in consequence of the dural opening already made. Usually, after the puncture, even when there

A *B* *C*

Fig. 3. To show configuration of head after a single, and subsequently after a bilateral, combined operation. Patient with general pressure symptoms and focal epilepsy of nine months' duration. Photographs show weakness of right lower face. Tumor of lower left central region suspected.

A. Ten days after combined left exploration and decompression, September 23, 1908. No tumor disclosed. Temporary relief of all pressure symptoms; rapid gain in weight.

B. Some return of headache two months after first operation. Photograph two weeks after combined right exploration and decompression, December 5, 1908, with relief again of pressure symptoms.

C. Onset of characteristic dreamy states, with gustatory impressions, led to the suspicion of an uncinate gyrus tumor. Photograph ten days after third operation, February 12, 1909, namely, a simple reflection of the left temporal muscle with enlargement of the original bone defect, disclosing an inoperable glioma involving the uncinate region.

is a large tumor present, the hemisphere will settle back so that on reflection of the membrane (preferably with its base toward the middle line in the reverse position to the customary flap) a thorough exploration is permissible in all directions under the dural margin.

As an aid to this exploration I have found a spoon-shaped, round-edged spatula (Fig. 2) a very helpful instrument, for by its use the cortex can be pressed away without the danger of injury to the pial vessels which exists when the usual flat, square-edged spatula is employed. It is usually possible to investigate the condition of the cortex from pole to pole, even with a dural opening relatively no larger than that shown in the figure.

In case no surface evidence of a lesion is found, and if there are no justifications for subcortical investigation, the lateral margins of the dural flap are resutured in position, and the osteoplastic window is replaced. If the legs of the flap are well preserved there may be some difficulty in making the resected bone stand firmly in its original position, but if at the mesial border of the bone incision a wide beveled edge has been made with a Gigli saw the flap can be replaced securely enough, and the operation results in leaving a generous defect under the temporal muscle, much as though the resection and exploration had not been a part of the decompressive measure.

This combined method of exploration and decompression was first employed in the fall of 1907 and I have since had about twenty operations of this type with fairly uniform satisfaction in the procedure. There have been no complications of any kind, though on one or two occasions a somewhat larger subtemporal opening than was left would have been desirable. Under these circumstances, however, a gradual lifting of the lower edge of the flap is likely to occur, and this usually suffices to give ample relief to pressure symptoms. The resulting deformity is not particularly obtrusive (Fig. 3).

In a number of patients tumors have been unexpectedly disclosed in consequence of the wide exploration which is permitted by this

method — twice they have proved to be in the temporal lobe and would not have been brought into view if the subtemporal opening had not been made. In two instances a growth too far below the cortex to be identified has been found at a subsequent operation, and in another patient a supposedly inoperable tumor (glioma?) of the temporal lobe which had been exposed in this way was found at operation a year later to have degenerated and to have been replaced by a cyst.

The method is available also for cases in which a tumor may actually have been extirpated should there seem to be any reason for leaving a defect either to allow for the postoperative œdema which may occur, or to allow for a future protrusion should the growth not have been totally removed or, in case of a glioma, should there be apprehension of a possible recurrence.

Summary. The usual osteoplastic method of exploration of the cerebral hemispheres for a tumor, which, after exposure, proves to be inoperable, can only be transformed into a palliative or decompressive measure by the removal of the osseous layer of the resected flap. This frequently leads to undesirable consequences, owing to the unnecessarily extensive protrusion which may occur when the brain under tension is protected by scalp alone.

In these cases the bone-flap may be preserved and a sufficient hernia, under the protection of the temporal muscle be provided for through the removal, while the flap is temporarily resected, of the area of bone which underlies the muscle. Thus the advantages of the usual subtemporal decompression can be combined with the more extensive cortical exploration permitted by a temporary osteoplastic resection.

SECOND REPORT OF A CASE OF BLASTOMYCOSIS OF THE SKIN WITH NOTES ON THREE ADDITIONAL CASES OF BLASTOMYCETIC INFECTION[1]

With Special Reference to the Effect of Traumatism in Producing a Fresh Outbreak of the Disease

By A. PRIMROSE, M. B., C. M. (Edin)., M. R. C. S. (Eng.)
Surgeon to the Toronto General Hospital; Associate Professor of Clinical Surgery in the University of Toronto

SINCE the first clinical record of blastomycosis was published by Busse (1) in 1894, a large number of cases have been reported in medical literature. A considerable majority of these have been described as purely cutaneous affections, but a number of generalized systemic infections have also been reported. Hektoen (2) has collected some thirteen cases of the latter, and he has made a careful study of the manifestations of the disease in that form.

Interest attaching to the present case exists in the fact that the history has extended over some eight and a half years, and the patient has been under more or less continuous observation during that entire period, moreover, the disease has maintained throughout, its original characteristics and has remained a purely cutaneous affection, at least as far as the manifestation of definite lesions is concerned. The effect of traumatism in producing a fresh outbreak of the disease is a noteworthy feature in his more recent clinical history. The case was reported by me (3) in the Edinburgh Medical Journal of September, 1906, and the following is a brief summary thereof, together with his subsequent history:

T. B. D., age 28, came under my observation in July, 1901, suffering from multiple lesions of the face, shoulders, neck, and lower extremities. The first manifestation of the disease was observed by him in January, 1901. The patient was born in England, and for three years prior to coming under my care, had lived in Chicago. There is no history of syphilis or gonorrhœa.

[1] Read before the American Surgical Association, June 3, 1909.

One paternal uncle died of consumption, but otherwise there is no family record of tuberculosis.

I described in my previous paper fourteen skin lesions which were present in different parts of the body when he came under my observation. These all consisted of the characteristic patches forming crusts which on removal left a surface having irregular red papilliform vegetations scattered over it. The scrapings from the patches showed blastomycetes as round, highly refractile, double contoured bodies which showed evidence of multiplication by budding. One lesion at the root of the neck was excised. The patient took 180 grains of iodide of potassium daily, and under this treatment, the remaining patches rapidly disappeared. The excised lesion showed considerable hyperplasia of the epithelium, and between the epithelial cells were many leukocytes. The papillæ were much congested and infiltrated with polymorphonuclear leukocytes. In places small abscesses had formed, and within their cavities, between the leukocytes, blastomycetes were found. In the papillæ, in close proximity to the abscesses, granulation tissue with giant cells, similar to those found in tuberculosis, were seen.

The patient remained entirely free from trouble for three and a half months, when recurrence of the lesion on his neck took place, but for four years there was no further manifestation of the disease in any other part of the body. The recurrent cervical lesion would largely disappear under the administration of iodide of potassium, but would recur from time to time. I removed this lesion by operation in June, 1905, nearly four years after the initial treatment.

In June, 1906, whilst lifting some heavy weights he injured the right testicle and subsequently suffered from cystitis and retention of urine. A few days subsequently he struck the swollen testicle by falling against a pole. The left testicle also swelled, and on each side of the scrotum a small abscess formed and ruptured spontaneously. These abscesses healed up within a few days, but at the point where the abscess ruptured on the left side a small papillomatous lesion appeared in the skin, and from that point, a typical blastomycetic patch developed. A second patch appeared on the right side of the scrotum at a higher point. These lesions disappeared spontaneously without treatment of any kind and he remained completely free from trouble for eighteen months, when without any apparent injury, he had a recurrence of the trouble in the scrotum, and he then came to me for treatment. At that time two areas existed in the scrotum, one on the right side and the other on the left (Fig. 1). Each patch was about 5 cm. in diameter and of irregular outline. The patch on the right side was attached to an indurated nodule continuous with the testicle, representing the point at which suppuration had occurred. This indurated mass extended into and involved the epididymis. On November 16, 1908, the cutaneous lesions were both excised, and on the right side, the testicle and epididymis were removed along with the patch, the vas deferens being divided as high up as possible. Blastomycetes were demonstrated as before in the sections of the patches which were removed. The wounds healed kindly and the patient was discharged apparently free from all evidence of disease.

Fig. 1. Blastomycosis of the scrotum.

Two guinea pigs were inoculated with an emulsion made from the scrapings of the lesions. In one the inoculation was subcutaneous, in the other it was intraperitoneal. These animals were kept under observation for six months and were then killed, but careful examination of the blood and of the tissues generally failed to determine the existence of any disease having been transmitted to them.

Six months have elapsed since the last operation and the patient is entirely free from trouble. He has gained in weight and is in excellent health. In view of observations which have been made regarding the finding of blastomycetes in the blood and of the possibility of their existence there accounting for fresh outbreaks of the disease, I had the blood of my patient examined recently at a time when he had for some months been apparently free from trouble and had no local lesions. The blood examination showed nothing abnormal and the cultures taken all gave negative results.

In my previous paper I pointed out, after studying sections of affected tissue in the two

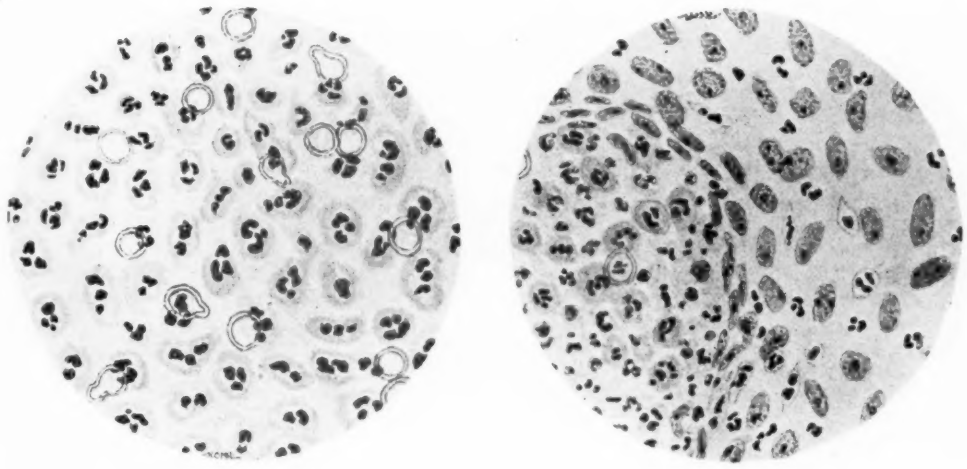

Fig. 2. Drawings made from a section through a small abscess in the excised tissue.

classes of cases, certain differences which existed between the organism as found in the disease which was described by Montgomery (4) from the San Joaquin Valley in California, and that isolated from my own case. To quote from my own paper (3): "In the first place, the distribution of the micro-organisms was very different in the two cases; these were found in the giant cells and also scattered free in the granulation tissue, and very rarely in the abscesses in Montgomery's case, whilst in sections from my patient the organisms were practically restricted to the abscesses (Fig. 2), and were not found in the organised tissues. Furthermore whilst the characteristic organisms with a clear capsule and double contour were present in both cases, it was found that in Montgomery's case these bodies exhibited a spore formation of an endogenous character, the capsule being filled with a number of small spherules; in some cases the capsule had broken, and the spores were seen escaping from it. In my case no such spore formation could be found; the organisms here and there were budding, but the capsules always contained simple undifferentiated protoplasm. Thus it would appear that these two diseases which are so similar in many respects show a marked dissimilarity in the appearance of the affected tissues and the relation of the micro-organisms to those tissues. These observations suggest either that there are different forms of organism responsible for different forms of disease, or that blastomycetes may behave differently under different conditions, at one time producing endogenous spores, and at others exhibiting division by budding. Or again, these organisms may in one phase of their development be found embedded in the tissues, and at others free in the abscesses which have formed at the seat of the disease."

These differences have been studied with great care in recent years by Ricketts (5), Ophüls (6), Coley and Tracy (7), Hektoen (2), and others. Observations have been made, both clinical and pathological, which have established the fact that the organisms are not identical either in their life history or in the clinical manifestations of disease presented by them. Ophüls proposes to call the disease of the California type "coccidioidal granuloma" to distinguish it from "blastomycosis" and his suggestions in this regard have generally been adopted.

It is true that many of the gross lesions are very similar, but coccidioidal granuloma is progressive and singularly fatal as compared with blastomycosis, so that of the eighteen cases of the former disease hitherto reported only one is known to have survived, and that

was in the case of a patient where the primary lesion was in the foot, and amputation was promptly carried out. In coccidioidal granuloma the disease spreads by the lymph and blood streams with marked tendency to involvement of the lymphatic glands; this is not the case in blastomycosis. In the latter, the disease is usually local and progresses slowly, exceptionally however systemic generalized infection occurs of a very fatal type, thus of 42 cases of blastomycosis collected by Coley and Tracy, 32 were local and 10 disseminated. The most outstanding characteristics in the organisms which serve to differentiate them are that the blastomycetes multiply by budding, and in cultures show no mycelium; the coccidia on the other hand, multiply by endogenous sporulation and in cultures produce mycelia.

Distinctive characteristics are not absolute, for example, Irons and Graham (8) report a case of generalized blastomycosis in which the blastomycetoid form was found in the tissues without sporulation or mycelia, whilst a culture from the infected tissue grew rapidly in both mycelial and budding forms. This circumstance shows the difficulty in determining specific groups of organisms and would show the correctness of the observation of Professor James Ewing, who, in discussing the organisms found in the cases reported by Coley and Tracy (7) states, "'There seems to be a great many species in the group, some in which budding is more prominent; others in which mycelium formation is more pronounced. Unfortunately these characters are not stable; hence the difficulty in classification." Then too, in a case of systemic blastomycosis described by Le Count and Meyers (9) sporulation was said to have been found in a lesion in the cerebellum, although in the record it would appear that the evidence of this is not absolutely conclusive, as it is based upon the fact of finding small spherules free and the existence of empty capsules, which were supposed to have discharged their spores, and in the absenc of budding forms.

The mere finding of the blastomycetes in the curettings in skin disease is not sufficient to establish the fact that these organisms are the causal factor in the disease. There can be little doubt but that the blastomycetes are pathogenic in the recorded cases, but these organisms have been found where this was not the case. A somewhat striking series of observations have been published by Marzinowski and Bogrow (10). These authors state that they were able to isolate blastomycetes from the normal skin, particularly in localities where sebaceous material was abundant, such as the hairy scalp and the skin of the nose, also in many skin diseases which were clearly not blastomycetic in origin, for example, in acne vulgaris they found them in more than 50 per cent of the cases examined.

These organisms have been recovered from the blood in a few instances. This was first recorded by Buscke, and again in a patient suffering from systemic blastomycosis reported by Krost, Moes and Stober (11). It would be interesting in this regard to investigate the claim of Vedeler (12) who examined patients with various gynecological affections and pregnant women, and found in the blood, vegetable cells which he describes as blastomycetes, in all but 15 of the 221 cases examined; these were also found in the breast milk and in the leucorrhœal discharge. A somewhat similar observation is made by van de Velde (13) who took cultures from 77 gynecological patients suffering generally from acute inflammation of the cervical mucosa or exacerbation of chronic generally gonorrhœal inflammation — also in cases of vulvitis and colpitis in little girls and in pregnant women. In these cases reported by van de Velde the cultures were apparently made from the discharges and not from the blood. In blastomycosis, cultures have from time to time been obtained from the sputum and from the urine.

Apart from the finding of the organism in the blood one may note other interesting observations as the result of systemic blood examination. Harter and Lucien (14) publish a case of generalized blastomycosis in which there was marked anæmia (2,759,000 reds) with some leucocytosis (20,400 whites) and marked eosinophilia (23.125 per cent eosinophiles).

The site of the initial lesion in many cases of systemic blastomycosis appears to have been in the respiratory organs and the lungs, in various instances have shown gross lesions. In two of the thirteen cases of systemic affection

collected by Hektoen, however, there was a history of a typical chronic blastomycetic dermatitis existing for some time before the outbreak of the systemic infection. In coccidioidal granuloma the site of the initial lesion in eighteen cases reviewed by Brown (15) was five in the skin, twelve in internal organs (chiefly the lungs), and one unknown.

The clinical and pathological manifestations of the infection bear many resemblances to tuberculosis, for which the infection has been primarily mistaken in some instances. Oppenheim (16) describes the skin affection as "pseudolupus" although the lesions in the skin bear less resemblance to tuberculous disease than do those in other tissues. Microscopically the giant cells and endothelioid cells often closely resemble tubercle. In the lungs, ulceration and cavity formation has been described by Irons and Graham. The resemblance to tuberculosis lesions is still more definite in coccidioidal granuloma, and in this form of disease the lymph glands are involved in a manner not observed in blastomycosis. A further analogy may be established in my case in the tendency shown to recurrence of trouble as the result of traumatism. The lesions in the bones and joints may closely simulate tuberculosis. E. W. Ryerson (17) reports two such cases, one in which the knee was affected, and the other the dorsal spine producing a clinical picture resembling Pott's disease, and Powell's case noted below is another instance. In a patient whose case is recorded by Coley and Tracy, multiple tumor formation occurred (there were 60 such tumors in different parts of the body) which closely resembled on section giant celled sarcoma.

A remarkable fact regarding blastomycosis and coccidioidal granuloma is that very few cases have been reported out of America. Oppenheim at the International Dermatological Congress in New York in September, 1907, referred to three cases which had been observed by him in Neumann's clinic in 1904. Fourteen of the eighteen cases of coccidioidal granuloma collected by Coley and Tracy (7) had resided in the San Joaquin Valley in California, whilst a remarkably large number of the cases of blastomycosis came from Chicago and the Mississippi Valley. A number of cases have been observed in Canada. Shepherd (18) described two such cases in 1902 and another was reported by myself (3) in 1906 together with three other cases referred to in this paper.

Infection has been noted at the extremes of age, thus Hessler (19) describes a case of blastomycetic dermatitis in an infant of eight months. Both mother and child took iodide of potassium and the trouble entirely disappeared; again, Oberembt (20) describes a case of cutaneous blastomycosis at 72 years of age.

One must be careful in talking of "cure" in these cases. Oberembt (20) in reporting a case in February, 1908, makes the following statement: "In cases where the disease is limited in extent and well defined, complete removal is by far the best procedure. By this method the course of the disease is shortened and a cure more certain." There had been no recurrence after three years in his case after operation. My case refutes the validity of claiming a cure because of long intervals of freedom from all manifestation of disease, in my patient fresh outbreaks eventually occurred. Either the disease has remained dormant or fresh infection has taken place. The latter is not the likely explanation unless some hitherto unsuspected idiosyncrasy exists which leaves certain individuals prone to contract infection.

The administration of iodide of potassium is followed by definite improvement in blastomycosis and is apparently of no value whatever in coccidioidal granuloma. Blastomycetic vaccine has been tried by Christensen and Hektoen (21) but without any marked result.

I may now note some hitherto unpublished cases of blastomycosis observed in the Toronto General Hospital.

A case of blastomycetic dermatitis occurring in my own clinic, was admitted January the 19th, 1908. D. C., age 38, a market gardener. Six weeks before admission a lesion appeared on the back of the right wrist. He gives the somewhat suggestive history that he had been looking after a young heifer in the stable, that had a skin disease exhibiting a dry crust about the eyes, in the region of the shoulder and down the front legs. He did not notice any discharge therefrom. He thought he might have been infected from the animal. Two lesions developed in this patient on the front of his neck shortly before admission to the hospital. In scrapings from these lesions I found the typical blastomycetes; there was no evidence of spor-

Fig. 3. Blastomycosis of the elbow-joint resembling tuberculous disease.

ulation. Under administration of iodide of potassium the trouble disappeared. It is too soon, however, to pronounce him cured.

Another case which I had an opportunity of observing, was a patient under the care of my colleague, Dr. N. A. Powell, who exhibited a condition resembling tuberculosis of the elbow.

The history is as follows: J. M. D., a farmer, age 44, born in Canada, was struck in October, 1907, on the right elbow whilst at work in the stable. Swelling and pain resulted. He consulted Dr. Powell on December the 9th, 1907, when in addition to swelling about the right elbow there was a red area over the head of the radius and marked limitation of movement at the joint. Some of the tissue was removed under local anæsthesia and blastomycetes, exhibiting the characteristic features of the budding form, demonstrated from which successful cultures were made. Subsequently the affected tissue was thoroughly curetted but no direct connection with the elbow joint was determined. He was readmitted on May the 3d, 1908. The elbow presented an appearance very much like that of a tuberculous joint with fusiform enlargement (Fig. 3). Movement could only be carried out through an angle of three or four degrees. He had a considerable amount of pain, his general health had suffered greatly and he had lost in weight. He had been taking large doses of iodide of potassium without benefit. The wound, however, had healed. In view of the nature of the case amputation was advised and carried out on May 5th, 1908. He made a good recovery and when last heard from, on April 5th, 1909, was enjoying excellent health, with no further return of trouble.

I may mention yet another case admitted to the Toronto General Hospital, in this instance one of generalized blastomycosis which came to autopsy. This case will be recorded in full by my colleague, Professor J. J. MacKenzie shortly. In it there were blastomycetic abscesses in the neck with lesions also in the meninges of the brain and abscesses in the spleen and kidney; he also had blastomycetic bronchopneumonia, with extensive cavity formation in the lungs.

I am not aware of trauma being recorded hitherto as a factor in determining an outbreak of blastomycosis. In my first case as reported in this paper there was a definite history of injury preceding the appearance of the disease in the scrotum. Previous to this injury the scrotum had been quite free from disease although the patient had on former occasions exhibited lesions elsewhere in the body. Then again in Dr. Powell's case of affection of the elbow the starting point of the patient's trouble seemed to be an injury to the joint.

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THE TREATMENT OF TETANUS BY CHLORETONE[1]

By WILLARD H. HUTCHINGS, M. D., Detroit, Michigan

MR. PRESIDENT and Fellows of the American Surgical Association: It is my pleasant duty to thank you for the honor of being invited to present for your consideration a phase of the treatment of tetanus. While the treatment of this disease is still unsatisfactory, yet much substantial progress has been made since the time when "so many cases meant so many deaths." This is particularly true of its prophylaxis. That the thorough treatment of the wound together with the use of serum has greatly reduced the occurrence of tetanus there can be no doubt. However, when infection has taken place and symptoms have become manifest, treatment has not been so successful. Indeed, it has been so disappointing that many surgeons have come to believe that severe cases die despite all treatment, while mild cases recover under any treatment.

Let us consider for a moment what are the indications when we are confronted with a case of tetanus. First, we must remove the source of toxin supply. This can be accomplished by thorough local disinfection or by amputation. Second, we must neutralize the toxin present in the circulation which has not yet combined with the nerve cells. This is done very well by the injection of sufficient quantities of antitoxin. And this is all antitoxin will do. There are no theoretical grounds for belief and no clinical evidence to show that it affects in any way either the growth of the germ, or the nerve cell-toxin combination. Third, we must keep our patient alive until the body can overcome the effects of the toxin which has already entered into combination. Death, in a vast majority of cases, results from one of two causes. Either the amount of toxin is so large or so virulent that it directly affects a weak heart or the vital centers in the medulla, the patient dying in a few hours, or death results from exhaustion following the prolonged and severe muscular contractions. Practically all the former class will die. It is in the latter class, those which die from exhaustion, that treatment is more hopeful.

The object here is to control the muscular contractions, for it is as the result of these, directly or indirectly, that the patient dies. Directly, a prolonged severe convulsion may prevent air entering the lungs, the patient dying of asphyxia. Indirectly, prolonged violent muscular action produces greatly increased amounts of poisonous katabolic products which must be eliminated. At the same time, elimination by the lungs, the intestines, and the kidneys is interfered with. Together with this, it is frequently impossible to give sufficient nourishment. This unfortunate combination soon leads to a fatal issue. Provided the muscular manifestations can be controlled, we can prevent the increased katabolism, aid the eliminating organs to free the body of toxin, and give sufficient food to maintain the strength of the patient. To this end a number of agents have been recommended. Some time ago, in conjunction with Dr. Chas. T. McClintock, I began a comparative experimental study of the various methods of treatment which have won a recognized place in tetanus therapy. As the result of these experiments, we became convinced that chloretone was the best substance which had thus far been employed for the purpose of controlling the muscular manifestations of the disease. I have had the opportunity of treating by this method six cases of tetanus which have been referred to me, with five recoveries. Of these, one was mild, one moderate, three severe, and one fulminating. They are as follows:

Case 1. Hungarian 26 years old. Admitted to St. Mary's Hospital December 13, 1907. Seven days before admission, six before the appearance of symptoms, he crushed the distal phalanx of the middle finger of the left hand with a hammer. It was washed with water and wrapped in a clean cloth. He did not consult a surgeon and no further dressing was attempted. On the morning of the 13th, he complained of stiffness of his neck, inability to open his mouth, and pain in his back. This condition became worse during the day,

[1] Read by invitation at the meeting of the American Surgical Association, Philadelphia, June 4, 1909.

and that evening he was removed to the hospital. He was given 1,500 units of antitetanic serum (P. D. & Co.) every 24 hours together with large doses of morphine, chloral, and bromides. Despite this treatment, he became worse. I saw him first at 7 p. m., December 17th. At this time he was in violent tetanus. Clonic convulsions were frequent and severe, opisthotonos being marked. He could separate the teeth ½ cm. and could swallow. 30 grains of chloretone dissolved in ½ ounce of whiskey were given per mouth at 8 p. m. At 8:15 he was sleeping naturally with all his muscles completely relaxed. The jaws could be opened to their fullest extent. Vigorous palpation, loud talking and the flashing of an electric light in his eye caused no response. He remained sleeping quietly until 1 a. m. of the 18th when he awoke. The previous symptoms returned but were not so severe; 20 grains of chloretone in whiskey were at once given. This kept him quiet most of the time until 1 p. m. He could now swallow freely and took nourishment readily. He had no return of the clonic contractions. From this time the tonic contractions gradually lessened. He was able to open his jaws freely on the 22d, and on the morning of the 23d ate dry toast, chewing it well. The finger was amputated on the 18th. He received 1,500 units of serum and 30 grains of chloretone daily until the 22d when they were discontinued. At 4 p. m. of the 23d, the patient complained of severe pain in the abdomen, and the temperature, which had been normal since the 19th, went to 103 with pulse of 140. No symptoms of tetanus were present. He became rapidly worse and died at 6 o'clock the morning of the 24th. I did not see him during this time. I was, however, able to secure a post-mortem, which showed a perforation of the colon near the splenic flexure and general peritonitis. Cultures from the peritoneal exudate and heart blood showed a streptococcus. This patient had recovered from tetanus and all treatment had been suspended. He undoubtedly died as a result of the peritonitis. Cultures from finger were negative for tetanus.

Case 2. Female, unmarried, 23 years old. Had an abortion performed May 11, 1908, at 3 p. m. under chloroform at her home. The patient says that the instruments were boiled in soda water and that the doctor washed his hands carefully. She remained in bed until the 15th when she got up feeling well, and the following day, the 16th, went down town. On the 17th she was about the house and felt very well. About six p. m. she noticed a "queer feeling" while attempting to eat a banana. She did not seem to be able to chew properly, as the jaws felt rather stiff. She slept well during the night, but on the following morning, 18th, was unable to eat because of inability to open mouth. About 10 a. m., she again attempted to eat but could not. At this time her jaws felt stiff, heavy, and had a dragging sensation in them. During the afternoon this feeling became worse and the jaws painful. She was able to swallow fluids only. At this time she thought it was due to a wisdom tooth. The condition became gradually worse, the jaw more stiff and painful.

On the 19th she consulted a dentist who said her trouble was not due to a wisdom tooth. From the dentist's office she went to a soda fountain, where she attempted to swallow a cherry which was served with ice cream. This seemed to lodge in her throat, and she was unable either to swallow or regurgitate it. She then saw a doctor who was unable to get it out because the patient could not open her mouth. He gave her medicine to take every hour. About 10 p. m. the cherry was swallowed. During the evening she was as she says, "very nervous," the least unusual sound, particularly the telephone bell, making her "jump." She was badly frightened and had her jaws rubbed with turpentine. This gave no relief. On the 20th her jaws were more painful, and she could swallow fluids with difficulty and complained of a severe pain in her back. This pain was confined to the spinal column itself, not radiating on either side, and was of a dull aching character, while her back "felt stiff." She attempted to eat a small quantity of mashed potatoes which lodged in her throat. While talking about this, she had what she describes as a sudden "thrill," all her muscles contracting at one time, particularly those of the left side. Her head was drawn back. The feeling was like that of a severe shock from a small electric battery. She screamed, became hysterical, and declared that she was becoming paralyzed. A doctor was called who said it was a spasm of the nerves and gave her a nerve sedative. She was unable to take this in any quantities, it being necessary to take a drop only at a time because of the inability to open the jaws or swallow. She was now having spasms every 4 to 5 minutes. However, the medicine relieved these and she slept some during the night of the 20th. On the 21st she was no better. The convulsions were frequent, and becoming more severe while the condition of the jaws remained the same. She could swallow only small amounts of liquids and these with great difficulty. She saw another physician, who diagnosed nervous prostration and gave her bromides. This gave no relief. The pain in her back became worse and she now was biting her tongue every time she fell asleep. Because of this she remained awake during the night of the 21st. On the morning of the 22d she called another physician who diagnosed tetanus, and had the patient removed to St. Mary's Hospital. During this time the patient says her mental condition was keener than usual. I saw the patient at 10 a. m. May 22d. At this time she showed well marked tetanus. The muscles of the entire trunk were in tonic contraction, limbs not affected, head drawn back, muscles of mastication rigid; she could open her mouth ½ cm. and was unable to approximate chin to sternum. Clonic convulsions were frequent and severe. Any attempt to swallow caused violent convulsion lasting one minute. She was at once taken to the operating room and curetted under chloroform. An emulsion of these curettings injected into 350 gramme guinea pigs caused death from tetanus in six days. While under the anæsthetic, a stomach tube was passed and 30 grains of chloretone given dissolved in whiskey. This was almost immediately regurgitated. 2,000 units antitetanic serum (P. D. & Co.) were given subcutaneously

and 2,000 units intravenously. On recovering from anæsthetic, she was unable to swallow and all previous symptoms returned. 30 grains of chloretone dissolved in hot olive oil were given per rectum and retained. One hour after this was given, the patient was sleeping quietly, all muscles completely relaxed, while the mouth could be opened to its fullest extent. She remained in this condition until the following morning, when there was some rigidity of the abdominal and neck muscles. She could open the jaws about ½ cm. and took nourishment readily. An attempt to test patellar reflex caused several slight convulsions. The dose of chloretone was repeated. Within 30 minutes she was sleeping quietly, completely relaxed. From this time she made an uninterrupted recovery. The chloretone was repeated every 48 hours until May 30th, when it was discontinued. 3,000 units of antitetanic serum were daily given subcutaneously. During this time she took fluids readily, 4 liters of saline solution were given per rectum every 24 hours. Large quantities of urine were voided voluntarily and the bowels moved freely by large doses of cascara sagrada. She was discharged June 8th cured.

Case 3. Female, unmarried, 19 years old. On July 4th patient shot herself with 32 blank cartridge (Winchester) in left palmar surface of ring finger of left hand, near base, burning the skin and lacerating the deeper tissues. She at once consulted a physician, who washed the wound with antiseptic solutions and applied an ointment. No antitetanic serum was used. This dressing was repeated daily until July 16th, when she complained of severe pain in her back, localized in no particular place. During the evening of this day, she noticed a stiffness of the jaws. On the following morning, 17th, this stiffness had increased and extended to the muscles of the neck. There was some difficulty in swallowing and the pain was more severe. I saw her at 5 p. m. At this time, the muscles of the head and neck were rigid; jaws could be opened 1 cm.; chin could be only slightly approximated to sternum; abdominal muscles rigid; reflexes exaggerated; swallowed with difficulty; no clonic spasms. She was given 30 grains of chloretone by mouth in whiskey and 1,500 units of antitetanic serum (P. D. & Co.) subcutaneously in the abdomen. She passed a comfortable night, sleeping from 7 p. m. until 8 a. m. I saw the patient again at 10 a. m. July 18th. On being roused she had a well marked clonic convulsion lasting ½ minute. The other symptoms had not improved. She was given 30 grains of chloretone and removed to Harper Hospital. At 2 p. m., under chloroform anæsthesia, the wound was dressed. On separating the superficial tissues, an opening ½ cm. in diameter was found extending through the flexor tendon. This was enlarged, the edges cut away, and from the space behind the tendon small pieces of wadding and necrotic tissue were removed. These placed in glucose bouillon and grown in an atmosphere of hydrogen, showed tetanus bacilli at the end of 72 hours. One c. c. of the culture killed a 350 gramme guinea pig in 60 hours. The wound was thoroughly curetted, washed with hydrogen peroxide and packed with gauze saturated with balsam of Peru as recommended by Bockenheimer. While in the operating room she received 1,500 units of serum intravenously and 70 grains of chloretone dissolved in 2 ounces of hot olive oil per rectum. She recovered slowly from the anæsthetic, but at 5 p. m. could open her mouth well and swallow without difficulty; the muscles were much less rigid and the reflexes only slightly exaggerated. On the 19th her condition was unchanged. She could now swallow liquids without difficulty. She rested quietly, sleeping most of the time, but could be roused easily. On the 20th there was a slight increase in the muscular rigidity and the reflexes were increased. The dressing of the wound, however, caused no convulsion. She received 50 grains of chloretone in 1 ounce of olive oil per rectum and 1,500 units of serum subcutaneously. From this time she made an uninterrupted recovery, the muscular rigidity slowly disappearing. She received 50 grains of chloretone on the 21st and 30 grains on the 23d, and 1,500 units of serum daily until the 24th, when it was discontinued. 4 liters of saline were given every 24 hours per rectum by the drop method. The bowels were kept open by cascara sagrada, and large quantities of urine were voided. She was discharged cured August 1st.

Case 4. Pole, male, 24 years old. Was admitted to Harper Hospital May 28, 1908, for a severe crushing injury to left hand sustained in manipulating a bread mixing machine. The soft parts, particularly on the palmar surface, were badly lacerated, no bones were broken. After disinfection with soap, alcohol, and bichloride, the bleeding vessels were ligated with catgut and the parts approximated with catgut and silk worm sutures. Infection followed and a large portion of the flaps sloughed. On June 15th the necrosed integument and portions of three fingers were removed. At the same time a skin flap from the abdomen was sutured to the dorsal surface of the hand, the arm being retained in position by bandages. On June 22nd this flap was removed from its attachment. On June 29th a similar flap was applied to the palmar surface of the hand, and on July 6th this was removed and the abdominal wounds sutured with catgut. The patient did well until July 15th when he complained of stiffness of his jaws and pain in his back and neck. He became worse despite large doses of morphine and bromides and 1,500 units of serum daily. I saw the patient at 9:30 a. m. July 19th. At this time be showed well marked tetanus of a severe type. The muscles of the entire trunk were in a state of tonic contraction He was unable to separate the jaws to any appreciable extent and was entirely unable to swallow. The least external stimulus, such as opening a door or touching the bed, causing violent opisthotonos lasting from 30 seconds to 1½ minutes. During these attacks only the back of the head and the heels touched the bed. 75 grains of chloretone in 1 ounce of hot olive oil were given per rectum and he was at once taken to the operating room. The wounds on the hand and abdomen were thoroughly curretted and washed with hydrogen peroxide. Cultures made from these curettings, and animal inoculations were negative. 4,500 units anti-

tetanic serum (P. D. & Co.) were given intravenously in the right median basilic. At 3 p. m. he had completely recovered from the anæsthetic, was able to open the mouth 2 cm. and swallow freely. He had slight clonic convulsions at midnight, 1:15, 3:30, 4:30 and 8 a. m. At 10 a. m. on the 20th, he was given 60 grains of chloretone in olive oil per rectum. He had slight clonic convulsions at 11:15 a. m., 1:30, 3:15, 4:50, 5:03, 5:26 and 5:30 p. m. At 11:50 he had a well marked clonic convulsion, lasting 20, seconds with opisthotonos. He had no convulsions on the 21st, took nourishment readily, could open jaws 2½ cm. This continued until 5 p. m. of the 22d, when he had a well marked clonic convulsion with opisthotonos. This was repeated at 8:15. From this time until 1:30 a. m. of the 23d they increased in frequency and severity. At 1:30 he was given 60 grains of chloretone per rectum. He had no further clonic convulsions until 8 a. m. of the 25th, when the accidental dropping of a dish caused slight opisthotonos. At 7:10 a. m. of the 26th he received 30 grains of chloretone. At this time there was no tonic contractions of any muscles. He could open his mouth to its fullest extent and swallow without any difficulty. From this time he made a good recovery interrupted by a rise in temperature to 103° on the 30th, which was reduced by cold packs. Following the initial 4,500 units of serum intravenously, he received 1,500 units subcutaneously daily until the 28th, when they were discontinued. Six liters of saline were given per rectum every 24 hours until August 1st. Large quantities of urine were secreted and the bowels moved daily with large doses of cascara and C. C. pills.

Case 5. The patient was single, 19 years old, a student by occupation. She had suffered severely from dysmenorrhœa since the establishment of her periods at the age of 13. The uterus was found to be somewhat enlarged and retroverted, and to overcome the dysmenorrhœa, curettage and shortening of the round ligaments were advised. This operation was performed by Dr. Reuben Peterson, of Ann Arbor, November 17, 1908. As the uterus was freely movable, the abdomen was not opened, but the ligaments isolated and shortened within the inguinal canals through a single suprapubic incision. The shortened ligaments were held in place by catgut rendered sterile by the Claudius iodine method. The same material was employed for closing the canals and bringing the deeper portions of the incision together. Michel's clamps were used to coapt the edges of the skin incision. For 12 days the patient had an uninterrupted convalescence. The stitches were removed on the 10th day and the wound found to have healed by primary union. On the 12th day the patient laughingly said she thought she was going to have the mumps, as her face was sore at the angles of the jaw and the latter seemed stiff. Parotitis, which at times follows gynecologic operations, was suspected. Examination showed no enlargement of the glands and there was no elevation of temperature. The soreness and stiffness of the jaws continued about the same for the next few days. The patient sat up on the 15th day for a short time. The jaws were sore and stiff, so that she ate solid food with difficulty. However, there was no rise of temperature or pulse and the patient did not seem ill. For the next three days the patient's condition remained about the same with possibly a slightly increasing inability to open the jaws. The real nature of the disease was not suspected until the 8th day after the first complaints of stiffness about the jaws when the muscles of the back and the neck became rigid. There were sudden spasms of the muscles of the jaw, so that the patient frequently waked from a sound sleep from having bitten her tongue. As the day progressed the patient became quite excitable and for the first time the temperature was elevated, being 100° per rectum. I saw the patient about 11 p. m. December 6th, the 12th day after the operation and the 8th day since the development of the slight soreness and stiffness of the jaws. Examination at this time revealed marked trismus, the patient being unable to open her jaws. The muscles of the neck and back were rigid so that the patient could be lifted slightly from the bed by raising the head from the pillow. The abdominal muscles were rigid and somewhat painful on palpation. The patient had no difficulty in swallowing, although nourishment had to to be taken through a tube. There were slight twitchings of the muscles of the face, although no risus sardonicus. Sudden movements about the bed of the patient, as for example the turning on of the electric light, caused contraction of the muscles of the neck and back, although opisthotonos was not present. At 11:30 p. m. 60 grains of chloretone dissolved in hot olive oil were administered per rectum. Within an hour the clonic contractions of the back muscles had ceased. The patient was much less rigid and could open her jaws decidedly more than before the administration of the chloretone. She expressed herself as very comfortable but very sleepy, and thought she would have a good night. The patient slept until 5 a. m. when she awakened by the spasmodic biting of the tongue. At 7 a. m. there was a return of the clonic contractions in the muscles of the back, the convulsions occurring from one to four minutes apart. At 9 a. m. she was given 60 grains of chloretone by the rectum, and at 10 o'clock another 1,500 units of antitetanic serum. After the second dose of chloretone there was no recurrence of the convulsive seizures. There was a gradual relaxation of the rigid muscles although it was about a week before the jaws could be opened normally. Following the two large doses of chloretone the patient continued in a drowsy condition and slept a good portion of the time. Although there were no further muscular spasms, as an additional precaution, chloretone in 30 grain doses was given daily for three consecutive days. Saline solution per rectum was given every 2 hours beginning shortly after the administration of the first dose of chloretone. These injections were continued for 8 days although of necessity because of the intolerance of the rectum, the intervals between the injections had to be gradually lengthened. However, a large amount of saline solution was absorbed during this period. The bowels were kept open, at least one free movement being secured daily. After

the second dose of the antitetanic serum, the wound was examined. It was found to have healed by primary union with the exception of a small point at the extreme right hand corner. Here was situated a minute blister, containing clear serum. Careful bacteriological examination of this fluid failed to demonstrate the tetanus bacillus, the cultures showing stahylococci only. The patient left the hospital in excellent condition 32 days after her operation and 20 days after the first appearance of the tetanus.

CASE 6. American, 52 years old, chronic alcoholic. On January 25, 1909, patient fell from scaffolding, sustaining an open fracture of the right arm at the elbow. This was reduced by Dr. T. A. McGraw at St. Mary's Hospital at 11 a. m. The disease pursued an uneventful course until the evening of January 29th, four days later, when he complained of severe pain in his fractured arm and back. At 10:30 p. m., there was some rigidity of the jaws and difficulty in swallowing. During the night he received one grain of morphine and slept at intervals, complaining of pain when awake. At 7 a. m. January 30th, he had severe clonic convulsions. I saw the patient at 9:30. He was sitting up in bed in a state of marked emprosthotonos. His clothing was soaked with perspiration. The muscles of the entire body except the arms were in a state of marked tonic contraction. He could not separate the jaws in the slightest degree and was unable to swallow. Risus sardonicus was pronounced. During the five minutes of observation he had 8 severe convulsions. 75 grains of chloretone in 2 ounces of hot olive oil were given at once per rectum and retained. Under light chloroform anæsthesia, the wound was opened by Dr. McGraw, thoroughly curetted, washed with hydrogen peroxide and packed with gauze saturated with balsam Peru. He was returned from the operating room at 11 a. m. At 11:30 he was sleeping quietly, the jaws being widely separated, all muscles relaxed. Patellar reflex very slight. Vigorous palpation of the abdomen caused three slight clonic contractions. At 12 o'clock cultures were made from blood taken from the left median basilic with the idea of determining the presence of the tetanus bacillus. Unfortunately the cultures were broken on the way to the incubator. However, two 350 gramme guinea pigs were inoculated; one with 2 c. c. and the other with 1 c. c. of the blood from the same source. Both the pigs showed well marked tetanus at the end of 24 hours and were dead at the end of 60 hours. Cultures from the wound were positive for tetanus bacillus. 4,500 units antitetanic serum were given subcutaneously near the brachial plexus. The patient awoke at 1 p. m. and complained of pain in his arm. At this time there were no tonic contractions. He could open his mouth one inch and swallow with little difficulty. He had occasional slight clonic contractions during the afternoon and at 3:30 received 50 grains of chloretone in 1 ounce of olive oil per rectum. He remained quiet until 10:15 p. m., when he began to have severe clonic convulsions. 50 grains of chloretone in olive oil per rectum was almost immediately expelled. On account of the frequency and severity of the convulsions, he was anæsthetized and 50 grains of chloretone in 1 ounce of whiskey given per stomach tube. The effect was almost immediate. At 11 p. m. he was sleeping quietly, completely relaxed. He remained in this condition until 3 a. m. of the 31st when the pulse began to fail. At 9 a. m. the pulse was 170 to 180 and thready. At the same time, the respirations were 30, full and regular. Notwithstanding the administration of large quantities of saline by hypodermatoclysis and oxygen, the heart became gradually weaker. The pulse was imperceptible at 10:45 a. m. The respirations remained good until the pulse stopped, when they gradually became weaker and he died at 11:10 completely relaxed. Post-mortem was not allowed. I attribute death in this case to direct action of the enormous amount of toxin in the blood on a weakened heart. It has been demonstrated by animal experiments that chloretone kills by acting on the respiratory center without affecting the circulation. It will be noted in this case that while the pulse was very bad, the respirations were only slightly affected and that the patient died from failure of the circulation, not respiration.

In summarizing these cases it will be seen that three of them, 1, 2 and 4 were of the type which almost always die. Case 3 might have recovered and case 5 would probably have recovered under any treatment, while case 6 was the type which will usually die under any treatment. It will be noticed that the muscular manifestations were completely controlled in every case by the chloretone. This is all chloretone will do. It has no effect on the toxin circulating in the blood nor will it break up the combination between the nerve cells and the toxin, when this combination has already taken place. It has the further merit of being harmless. No fatal cases following its use have been reported although enormous doses have been taken with suicidal intent. In addition to this it is easy of administration. If the patient can swallow, it can be given by mouth dissolved in dilute alcohol. If this is not possible, it can be given per rectum dissolved in hot olive oil. I have given it this way in my later cases because its action is almost as prompt as when given by mouth and it does not disturb the stomach. In addition to this, chloretone lowers the temperature and has a slight diuretic action.

FURTHER OBSERVATIONS ON TRANSFUSION WITH A NOTE ON HÆMOLYSIS[1]

By G. W. CRILE, M. D., Cleveland, Ohio

THIS further report on transfusion is based on additional recent cases by my associate, Dr. Lower, my staff at Lakeside Hospital and myself, as well as a considerable number of cases personally communicated. All of the personal cases have been technically successful, that is to say, the desired amount of blood has been transferred without accident. There has been only occasional obstruction of the cannula by clotting; the effect upon the donor has been only transient; there has usually been no pain excepting at the first insertion of the hypodermic needle and occasionally the final closure of the skin. The latter has been done with less pain by inserting immediately, horsehair stitches in the skin loosely in continuous suture, then at the end of the transfusion these sutures are adjusted. Dr. Davis of Birmingham has designed a very useful diminutive hook which facilitates drawing the vessel through the cannula. The vein having a thinner wall lends itself a little better to the making of the cuff than the artery. Further experience emphasizes the importance of making a thorough dilation of the ends of the artery by spreading the blades of a mosquito forceps, which were previously covered with sterile vaseline and gently inserted. The artery should be drawn over the cannula beyond the point of possible injury to intima by the process of such dilation.

The physiological adjustment of the altered quantity of blood in the donor and the recipient is greatly facilitated by the use of tables either end of which may be lowered or elevated by the DeLatour apparatus. This gives so accurate and so smooth an adjustment that the patient experiences the minimum appreciation of the change. It has been found that contrary to common belief, normal blood of one individual does quite as well as that of another. Kinship apparently is of no special advantage. Obesity is a distinct handicap with respect to accessibility of the blood-vessels, to the greater difficulty in accurate observation, to the greater physical discomfort and to the uncertainty as to the circulatory apparatus, particularly the heart. The heart has proven itself to be the most important consideration in transfusion, especially on the following points:

Clinical and experimental evidence shows that the heart muscle itself is peculiarly dependent upon a sufficient circulation and oxidation for the performance of its functions. When, therefore, the recipient's heart presents a lesion to which there has been developed a compensating hypertrophy, this muscle is presumably working near its maximum at all times. Its normal factor of safety (Meltzer) therefore may be almost wholly lost.

Particular attention should be directed to a certain risk in transfusion in a deeply anæmic patient whether the heart is normal or abnormal. I refer to the marked impairment of the heart muscle itself in anæmia. This impairment is proportional to the depth of the anæmia and its duration. If, therefore, the circulation of an exsanguinated patient is rapidly recruited by fresh blood under a full head pressure from the radial artery of the donor, there will be an immediate and usually striking improvement. It is just at this point, when success seems almost certain, that the greatest caution is necessary, viz.: the anæmic myocardium may be unequal to performing the increased burden thrown upon it, and dilation may follow. With this dilation, blood accumulates in the distended chamber and the venous trunks and paralysis of the heart is threatened or actually occurs. This condition is best met by careful adjustment of the rate of flow, and having an assistant continually percussing the heart dullness so that at the first sign of dilation the flow is checked or stopped.

A hypodermic injection of digitalis or digitalin or strophanthin given prior to the transfusion is useful. The use of digitalis, the care-

[1] Read before the American Surgical Association, June, 1909.

ful observation by a well trained observer to detect any change in the area of the heart's dullness, and the use of stimulants to the cardiac muscle, constitute apparently the most effective means of avoiding the dangers under consideration. It might be suggested that if the patient be swung feet down, that the right heart would then empty itself into the largest venous trunks and bring relief. So far as the heart is concerned, it is undoubtedly true, but in relieving the heart there is in certain cases at least, danger of damaging anæmia of the brain, the latter being no less important than the former. The brain must be kept in the down posture to get its dribble of blood until a sufficient circulation is established, after which there no longer remains any objection to the feet down posture. Indeed, it is then the indicated procedure. The most effective active measure to overcome an acute dilatation is rhythmic compression of the chest. Under these circumstances, the entire bony cage of the thorax when so compressed exerts a pressure upon all of the blood-vessels within the thorax. The blood in the dilated chambers and the venous trunks will be pushed onward escaping from the thorax because the valves of the heart and the valves of the veins prevent its retrogression. Very soon the circulation will be obviously improved, the heart dullness will diminish, the respirations diminish in rate and increase in depth, the lividity slowly disappear, and the heart will resume a more nearly normal function. There being now a larger volume of blood energized by an efficient action of the heart muscle the brain itself will be much better nourished, and the patient may then be very slowly transferred from the head down posture to the horizontal posture, or as far as it seems safe to go. After the lapse of some time — perhaps ten minutes, the blood stream from the donor may then again be permitted to slowly flow. Observing closely the cardiac phenomena and with the slightest appearance of dilation artificial assistance is again given by pressure upon the thorax as before. Once this first stage of the anæmia of the myocardium is safely passed, but little further trouble need be anticipated until a normal volume of blood has been again regained.

As to clinical results, there has been no recent evidence which justifies any material modification of the conclusion previously given — viz.: that in pernicious anæmia, toxæmia, certain drug poisonings, luekæmia, Hodgkin's disease, carcinoma and uræmia no benefit has been observed. In a case of hyperthyroidism, personally reported by Bloodgood, improvement apparently followed the transfusion. In a case of Pellagra, Cole noted a rapid convalescence after transfusion from an immune donor. If performed before irreparable damage is done by the anæmia, transfusion is specific in acute hæmorrhage. In suitable cases it has been of very great value in the prevention and the relief of the circulatory phenomena of shock.

Dr. Prendergast in my laboratory recently observed a striking result in transfusing a dog with a severe attack of the distemper, from a donor that had just recovered. The disease cleared up with remarkable rapidity. A certain though small amount of encouragement has followed the results of transfusion in tuberculosis.

As influencing operative surgery, further experience amply confirms our earlier observations in grave or even impossible surgical risks by the preliminary, contemporaneous, and when necessary, post-operative transfusion.

There are two notable groups that have shown themselves susceptible to results, not less than remarkable in contemporaneous transfusion: those in which there has been internal hæmorrhage, grave, perhaps continuous hæmorrhage; the other class include those in which the patient is reduced by long continued disease, starvation or otherwise to such a degree as to render them unsafe for the operation indicated. In these cases the donor is attached, a sufficient amount of blood is transferred until the recipient is sufficiently restored to safely take the anæsthetic. All preparations having been made, the patient may then be anæsthetized. In the course of the operation, the needed amount of blood may then be transferred from time to time by the assistant in charge at the direction of the surgeon. At the close of the operation, a sufficient amount of additional blood is transferred to ensure post-operative safety of the circulation.

The technique of transfusion is exacting and may be difficult. Transfusion is rarely neces-

sary in the routine surgical work. Its indication is reached in certain otherwise irremediable emergencies and in reclaiming a definite group of handicapped cases.

NOTE ON HÆMOLYSIS

Clinical consideration of hæmolysis must take into account two facts. First: That hæmolysis is but one form of manifestation of the interaction between the blood of one individual against the blood of another. Second: That if there is hæmolysis *in vitro* it by no means necessarily follows that there will be hæmolysis *in vivo*. In fact their agreement may be the exception. For example — I have transfused eighteen cases of tuberculosis. In most of these the donor's blood hæmolized the blood of the recipient in the test tube, but not in the patient. On theoretic grounds, transfusion in these cases should be fatal, but in practice, no unfavorable results appeared.

Incidentally, hæmolysis is a valuable aid to the diagnosis of active tuberculosis — the reaction occurring more frequently than in cancer. In the latter the reaction is largely dependent upon the stage of the disease at the time of the test. Hæmolysis usually occurs in the earlier stages; rarely in the late stages.

THORACIC SURGERY: EMPYEMA[1]

By ALBERT VANDER VEER, M. D., Albany, New York

MR. PRESIDENT: It is safe to assert there are few lesions where the physician and surgeon are called upon to assist each other in diagnosis and treatment, more interesting, and at times, more difficult, than effusions within the pleura. Plastic pleurisy may have its surgical complications, but it is largely a medical condition, and one wherein the surgeon is not so much concerned. The serous effusions, however, present an entirely different history and line of procedure. Few conditions give so entertaining a solution of questions that, seemingly, forty-five years ago, were so hidden and mysterious, studied at that period, and even for two decades later, with the firm belief that surgical intervention was too dangerous to undertake. As one recalls these early impressions one cannot but feel encouraged over the fact that in this line of investigation operative surgery has made advances commensurate with the pathology and technique of other important branches of our art. It is not my province to discuss why a serous effusion in one case, where one-fourth, one-half, or even more of one side of the chest may be involved, may continue for months, or even years, without any evidence of pus being present, and yet another case with the same clinical history may in a few weeks or months terminate in pus and present the condition we term empyema. The only argument I have to offer in presenting this paper is my personal, practical experience. The point I wish to bring out is the change, in my time, and in the memory of many members of our profession here to-day, in the surgical treatment of these cases. The willingness with which the general practitioner encourages the surgeon to approach these cases to-day, compared with four, three, or even only two decades ago, is comparable only to the advance that has been made in the treatment of lesions of the appendix, the gall-bladder, and other organs within the abdomen, yet it cannot be said that this change is entirely due to the aseptic surgery that has permitted us to invade the peritoneal cavity so boldly, for the technique of the two operations is very different. My early recollection of surgery of the chest presents a strong contrast with what we are now doing so fearlessly. Then, when once it was determined to evacuate fluid from the pleural sac, almost invariably pus, what precautions were demanded! We had had it impressed upon us, by such splendid men as Trousseau, and others, as early as 1846, and

[1] Read at the meeting of the American Surgical Association, Philadelphia, Pa., June 4, 1909.

again in 1864, that the operation for paracentesis was an exceedingly grave one, and should be had recourse to only "when there is danger to life from immediate suffocation, or when the effusion is very large." Marrote, writing at the same time, gives a clear distinction between sero-fibrinous and purulent effusions and states, "that the radical operation of incision is the only one in purulent effusions that is at all likely to lead to a cure," and he was right, yet how very slow were our surgeons in following this advice. How well do I call to mind the discussions in our societies well on up to 1880, as to the manner of treating effusions within the chest, in reference to evacuation and the entrance of air. In my early years of practice I had read Bowditch's discussion of the subject, presented as early as 1852, in which he advocated aspiration, and its application to all thoracic effusions; later another paper, published by him in the American Journal of the Medical Sciences, in 1864, in which he denies "that any ill results are likely to follow, or that purulent effusions cannot be effectually withdrawn through the capillary tubes provided for that operation." These were convincing contributions, yet how many suggestions were made at this time controverting his views! One very ingenious method was that of fastening about the cannula a portion of rubber tubing, or rubber dam, in such a manner that a trocar could be introduced and withdrawn under water, and the operation performed in such a way as to exclude the entrance of air into the chest cavity. This was a method that was advocated with a good deal of earnestness. My study of Bowditch's papers, and the experience I had had during the Civil War, led me to believe that these cases required free drainage, and that this fear on the part of the physician, and his unwillingness to yield to the advances of the surgeon's experience, would pass away, yet how slow was the progress. The method of simple aspiration carried with it such a high mortality that aseptic surgery was hailed as a factor of great assistance and incision was encouraged, but only with the employment of the strong carbolized spray. I have often seen this used, and compelled myself to make use of it, because of the pressure brought to bear by the attending physician, who wanted Listerism carried out to the utmost, and yet how clearly would Nature demonstrate her ability to take care of the chest cavity if only a free opening were provided! In 1864, Dr. Howard, of the United States Army, was permitted to go to the front to treat gunshot wounds of the lung by immediately sealing the wounds of entrance and exit with collodion, then applying firm compresses over the chest, the object being to exclude the air. I had an opportunity of witnessing this procedure in several cases and in every instance if the effusion of blood did not force the dressing, the accumulation of pus would be such that the dressings would become saturated and Nature would assert her desire for free drainage. At that time I considered thoughtfully the *few* remarkable cases, such as that of General Shields during the Mexican War, and others, in which it was said a silk handkerchief was passed through from one opening to the other, recovery following, and it seemed to me that Dr. Howard's method would soon be counted a failure, which it was within a very short period. However, I did not make use of my impressions afterward, in civil practice, for the opinion of the general practitioner with whom I came in contact was opposed to any such procedure as a free opening into the chest, but Dr. Bowditch's views were gaining ground and were bound to prevail.

Among the number of gunshot wounds of the chest and perforation of the lung, treated successfully by myself during the Civil War, the following is most typical:

Lieut. A. N., 66th N. Y. Vols., age twenty-one years, July 21, 1865, while with his company, in trying to control a riot, was struck by a Minie ball, which entered the cavity of the thorax, between the sternal end of the left clavicle and the second rib, without fracturing either. The wound was received while advancing towards the person firing, who was not more than fifteen feet distant. This bullet passed directly through the apex of the lung, making its exit just above the spine of the scapula, fracturing the latter bone severely. He was wounded at six p. m., and I saw him about a half hour later. The patient was bleeding very freely, expectorating blood, respiration extremely difficult, pulse rapid and hard to count; pupils largely dilated; suffering much pain. I immediately gave him ¼ gr. of morphine, continuing the same as needed, at the same time giving as much brandy as he could swallow — in all about six oz. during the night. Ice

compresses were placed to anterior wound, and hard linen ones to posterior exit of ball. Two minims of tincture of aconite were given every two hours next day, with small pieces of ice in mouth to allay thirst, patient kept absolutely quiet on back; apparently little hæmorrhage, and no blood expectorated; no color in face or lips; very anxious expression; passed urine in small quantities and infrequently. More comfortable during second night, but somewhat delirious. Pulse 120–130, short and quick, feeling the effects of stimulus; catheter necessary to relieve bladder of a large quantity of urine; no desire to move bowels; very restless third night, starting suddenly and saying he would die if something were not done for his relief. Under assuring words and medicine he quieted down. Complained of bed feeling hot; changed same, but not his shirt in which he was wounded. He had bled sufficiently to saturate two thick hair mattresses, blood was beginning to drop to the floor. Fifth day expression improved somewhat, and pulse, under aconite, reduced to about 100; respiration easier. Air passed in and out through both wounds when compresses were removed. Evidently a large branch bronchial tube had been injured. Same general treatment continued until June 28th, eighth day, when aconite was discontinued. Bowels moved and patient passed urine freely in normal manner; appetite good; partook freely of beef tea, soft cooked eggs, etc. Patient had been a prisoner for several months in rebel prison in 1864–65, and we feared a return of the chronic diarrhœa he then suffered from. The discharge commenced at this time, June 28th, from both wounds, at first clotted blood, then pus. Wound was kept clean by frequent washing with soap and warm water and a saturated solution of chlorinate of soda, also the use of a silver drainage tube posteriorly. July 12th general condition much improved; no secondary hæmorrhages; treatment continued about the same; very small amount of stimulant given. Anterior wound healed; pus still discharging from posterior wound; there seemed no way of measuring the quantity yet it saturated a large pad and the back of his woolen shirt twice in twenty-four hours. Morphine in divided doses during the night to make him rest easily; tincture of iron continued, and some color in lips, but not much in face and his hands were pearly white. July 15th, in a. m. had a decided chill, not very free perspiration following; entire loss of appetite with some looseness of bowels; reason to fear pyemia; gave free doses of quinine and stimulants. Chill did not return and in a few days he felt better.

July 28th I removed several portions of the necrosed scapula; respiration good in lower lobe of left lung; lack of it, with entire dullness, on percussion, of upper lobe. Discharge from posterior wound enormous.

August 3d, patient can now sit up in bed and is able to be moved to his home in Westchester. The journey did not seem to exhaust him a great deal. He did well for about a week, when a severe attack of dysentery came on and reduced him rapidly. This yielded to treatment, and without further hindrance he continued to improve, and in a month was able to leave his bed. The discharge of pus continued quite freely for a time but gradually ceased, and on October 15th the posterior wound had healed entirely. Marked depression under left clavicle and some drooping of left shoulder; auscultation and percussion showed little use of upper lobe of left lung. He began a gradual course of exercise, continued his good diet, and improved very rapidly.

July 4, 1886, I was surprised to see what a complete recovery he had made. He had entire use of the lung, except a small portion of the apex, apparently just above the tract of the ball.

There are some points of particular interest in this case:

1. As to the great amount of blood lost, and the probable result had the wounds been closed in accordance with Dr. Howard's method, and the blood allowed, or forced, to remain in the cavity of the thorax.

2. The enormous quantity of pus discharged and in spite of this the ability of the patient to keep up.

3. The entire recovery of lung after it had been so long out of use, or in a state of collapse. In this case there was marked empyema. We attempted relief from this condition by using a silver tube, and keeping the wound in a dependent position, which I think was most beneficial.

In January, 1909, I had an opportunity of examining this wound, at Los Angeles, Cal. The Major had been living in Southern California for two winters, the climate appealing to him as affording more comfort than that of New York. Scarcely a scar could be seen at the point of entrance and exit. He had perfect use of his arms and Dr. Poddinger, who was so kind as to examine him, assured me the lung was quite normal in its function.

This case in my earlier years gave me much comfort in the treatment of cases of empyema, traumatic or otherwise.

As late as 1878, Powell, who was one of the best authorities at that time, in writing upon the subject of empyema said, "as it is clear that we cannot empty the pleura even in recent cases without admitting air in place of fluid, we must adopt one of three methods: 1st, either to disinfect the air admitted into the pleura, and having inserted a cannula, to close the wound with antiseptic dressings, to be removed with the same precautions every three or four days; or, 2d, to make a double opening and introduce

a drainage tube, so as to permit the escape of pus as rapidly as formed; or, 3d, to make a single incision or free opening, and insert a tube through which the pleura can be daily washed out with some disinfecting fluid." Of these three methods he says the first is to be preferred. At this period, or about 1880, and for the next five years, the discussion that older physicians gave the treatment of empyema, either by tapping or drainage, and finally, much later, by resection of the ribs, was most strenuous. My own experience with individual and older physicians was most emphatic. Occasional reports of a single case, by earnest operators, such as Martindale, of Port Richmond, presented in the American Journal of the Medical Sciences, July, 1881, were well worth studying, and illustrated the good effect of through and through drainage. In the Medical News, May 7, 1887, Dr. Strickler, of Colorado Springs, presents a most interesting paper on resection of the ribs, and the treatment of empyema, but at this late period the old theories were in his mind, for here he states, "that no disturbance was caused by the admission of air into the chest cavity."

In my own mind the decade from 1880 to 1890 presented a period of time when I had worked out the treatment of pleuritic effusion, and it has been my guide since. Antiseptic surgery, by means of the carbolized spray and aspirator, was not practicable in the treatment of such cases, and this became my formula: In a diagnosis of pleuritic effusion, when the temperature and pulse indicated that the fluid was yet sterile serum, I have insisted upon a very thorough effort at medical treatment being made, such as the use of a thoroughly dry diet, local application of blisters, free evacuation of the bowels, outdoor exposure, plenty of sleep, and I have seen many happy results, both in children and adults, the latter more particularly. When there is a rise in temperature, increase in the pulse rate, perhaps a chill, and later a marked leucocytosis, and the suspicion arises that pus may be present, I have always insisted upon a free evacuation, but I have had strange experiences occasionally. The evacuation of pus by means of the trocar would result in the recovery of the patient, and this case was held up as an illustration by many conservative physicians in the neighborhood as one in which even drainage by means of the rubber tube was not necessary. Any excuse was offered for non-operative intervention. This, however, was finally the ground of compromise: That if the trocar and the drainage tube did not bring about a good result within a reasonable time, I was not willing to yield any further to the conservatism of the good and respected family physician. If, however, the fluid remains sterile I believe a small percentage of these cases will recover by judicious, repeated use of the aspirator, but when once pus is discovered, the use of the trocar and introduction of the rubber drainage tube is admissible, having the opening as low down as possible, and keeping the tube within the pus cavity. This treatment in cases under twenty-one years of age gives a very large percentage of recoveries. Failing, however, at this time in life, and particularly after the age of twenty-five, in this line of treatment, then resection of one, two, three, or four ribs, two to five inches, becomes necessary.

I have a record of a number of cases of pleurisy associated with malignant conditions, not only of the lung but of growths elsewhere, in which the patient suffered from the associated attacks of pleurisy, and where I have seen marked relief from simple aspiration, going no further in other cases than to introduce the rubber drainage tube.

Cases of double empyema have, in my practice, been very rare. Much has been said regarding the danger of syncope and death, in the evacuation of pus, in all cases, either double or single, but the only fatal case I have encountered was that of a boy four years of age, who was suffering from double empyema, who had little breathing space left, and was very nervous and frightened at the thought of having anything done. Local anæsthesia was attempted but his struggles were so great we were finally forced to give him a general anæsthetic, and just as I was puncturing the right chest the little fellow collapsed and expired. It has been my custom to evacuate the chest with great care, always insisting upon the horizontal position of the patient and I have seldom seen a case of syncope. This case was a sad one in many ways and not infrequently

quoted by friends when a similar line of procedure was suggested.

The use of the rubber drainage tube as the sole dependence in the treatment of cases of empyema, especially in adults, cannot be considered as a successful method. In children it is likely to produce more serious deformity, and adults, if they do not recover at once, undergo a prolonged illness. Unless the patient's surroundings are especially good, and the previous family history above all possible suspicion, I have noticed that tuberculosis, in many instances, presents as the final condition.

It is interesting to note how the cavity of the pleura is disturbed and the distressing cough and irritable conditions that present when the loss of the drainage tube takes place. I have been called to see these cases and have noticed the great disturbances that presented in a train of symptoms having a most depressing, unpleasant effect upon the patient and friends, but I have not yet met with a case in which a foreign substance eluded resection, an accident that ought not to occur.

That empyema has claimed many methods and a great variety of operations for its relief cannot be denied, but like many surgical questions the solution has been delayed through the tenacity with which the family physician would, in former days, adhere to milder surgical procedures, this, however, finally passing away. Their views were greatly to be respected and their arguments for a conservative line of treatment of these cases met with some success, but I am convinced, and feel to assert that there can be no longer any doubt that the sooner a case of empyema is relieved (that in a number of cases resection of the rib is really necessary), and that this line of treatment must prevail to a greater degree in the future than in the past.

In the washing out of the cavity, after resection, and when employing simple drainage by means of the rubber drainage tube, I have had my attention called to the unpleasant effect of the use of peroxide of hydrogen. This is to be expected, and long since I have counseled against this antiseptic, employing much milder preparations which do not give the patient so much distress.

I have observed with much interest the cases that have come to me, and in which I have been called in consultation, where the patient had a rapid change from the formation of serous effusion into that of pus, and the general infection of the system, as illustrated by the following case:

M. R., age four years; history of tuberculosis on maternal and paternal sides. Case came under observation July 3, 1908.

Previous History. Supposed to have had enteric fever when an infant; a year ago suffered from quite a severe attack of whooping-cough; ten weeks ago had an attack of measles, later followed by pneumonia. In the early part of the attack of measles patient had otitis media of right ear, and which soon discharged quite freely. About this time left knee began to swell, and a week later swelling of the right shoulder. At the end of five weeks drainage tube was introduced and pus drained from bursa of left knee and abscess about right shoulder. Two weeks later empyema presented, and trocar used, with introduction of rubber drainage tube in right pleural cavity. Knee and shoulder improved but drainage from side not satisfactory. July 3, 1908, two ribs were thoroughly resected and an abscess containing about 500 c. c. of purulent fluid escaped. Drainage continued very profuse. From this time on patient improved rapidly and has made a splendid recovery.

That repeated cases of pneumonia often deceive the general practitioner, regarding the complication of empyema, and as to the possibility of tuberculosis being present, is, in my mind, a fact.

I have sometimes witnessed a very earnest discussion, on consultation, as to whether the case was one of simple plastic pleurisy, one of chronic consolidation, or one of true empyema, and I have no doubt in my mind that there are many cases of pneumonia associated with pleurisy in which an unexpected condition of empyema creeps in and is present without being recognized as promptly as it should by the family physician. The following case, one of many, is of some value in illustrating this point:

Mr. J. W., age 45 years, farmer by occupation. May 8, 1908, suffered from pain in right side, and in June had an attack of pneumonia, same side. This was followed by attacks of coughing and pain on inspiration. Cough paroxysmal, which had persisted since onset, usually occurring during morning hours, at which time patient expectorated freely, coughing up profuse secretion, described as resembling oyster juice, with sweetish taste, but free from odor. At times he had expectorated a quart of this material, and not

infrequently a pint or more. During attacks pain was present on right side of chest. Had lost in weight and strength. No history of night sweats; otherwise, history negative. There was much discussion as to the case being one of tuberculosis, or consolidation from pneumonia, possibly plastic pleurisy, but with no admission as to empyema being present. Blood count did not show a leucocytosis above 6,250. Frequent examination of sputum showed an enormous number of pus cells, but no tuberculosis. May 14, 1908, I believed the patient was suffering from empyema, and did a thorough resection of the fifth and sixth ribs, opening into a large abscess cavity with an adhesion to the fourth and fifth ribs and to the pleura that acted, as the lung had contracted, to give it the appearance of an hour-glass contraction. These adhesions were loosened and revealed a free opening into a large bronchus, also marked necrosis of the ribs. This cavity was well packed with three large tampons of sterile gauze and around a large rubber drainage tube. The patient made an uninterrupted recovery, cough abating at once, expectoration ceased, he gained rapidly in flesh and has made a good recovery, with the exception of a slight sinus, about two or three inches in depth, which remained when he was last examined, April 1, 1909. The lung had returned to its normal condition regarding function. It is very impressive to note how cases of empyema will go on, the patients remaining invalids, and treated for one condition and another, but when at last reached are not unlike those of neglected appendicitis.

For some time I have discouraged the use of iodoform gauze as a dressing, and for the treatment of the large cavity that remains after resection of the ribs I make use of either vermiform or just plain sterilized gauze. I believe it is well to pack the cavity somewhat firmly at first, so that the lung is not embarrassed by the lack of support, the patient is made more comfortable, and then, at the end of forty-eight hours the dressing removed and packed much more lightly.

The use of the hypodermic syringe as a means of diagnosis is of vast help; the use of the aspirator in evacuating a chest that contains aseptic fluids is to be commended, and the use of the instrument can be repeated a number of times, but great care should be exercised in the laboratory examination of the fluid withdrawn, the least indication of pus that presents being a warning for the abandonment of this method.

I have been greatly impressed with the reports coming from the laboratory regarding the mixed infection that presents in cases of empyema, and how very seldom the bacilli of tuberculosis are found.

I have also been very much impressed regarding the length of time that pus has existed, or where the condition of empyema has been present, in the cases that have come under my observation, and of which the following are but illustrations of others:

Mr. G. F. C. age thirty-nine years, salesman by occupation, came under observation November 7, 1904. Patient had had diseases of childhood, during which time he was supposed to have had pleurisy.

Present Illness. Four years ago was ill for three days with a diagnosis of pleurisy of right side. Recovered and apparently well for two years when an abscess presented to the right of right nipple, which was lanced, discharged quite freely, healed for some time, formed again later, and discharged for six months. Then another abscess formed nearer nipple which was also lanced. This has been discharging ever since, and particularly profuse for past four weeks. Patient's weight has remained about the same.

This abscess was very annoying in getting about to his business. I advised resection of ribs, which was done November 8, 1904, resecting about four inches in length of fifth, sixth, and seventh ribs, when an abscess was opened into connecting with the sinus, abscess extending from apex of the lung to the diaphragm and having a capacity of about thirty fluid ounces. Lung completely walled off, and surface of the pleural cavity lined with a thick calcareous coating. The latter was dissected out as much as possible and cavity then packed with plain gauze around a large rubber drainage tube. Gauze gradually removed and drainage tube relied upon, through which irrigation was kept up, patient making a good recovery. January 6, and March 12, 1905, family physician, as well as patient, reported a steady improvement. Again in the spring of 1906 report came that he was doing well but a short sinus persisted. Lung had expanded well.

I have been interested in noting the phosphatic deposits that are found in long-standing cases of infection of the pleura, and I believe that better results come from attempting to dissect out, as carefully as possible, that portion of the thickened pleura that can be reached.

Cases of empyema, or multiple abscess, particularly in children, are the ones to watch with prompt care and we should not fail to make our operations quite thorough. I fear that at times we fail, perhaps, in giving full relief, as the following case illustrates:

M. H., age six years, came under observation February 12, 1904. Principal symptom that of a persistent cough and p. m. temperature. Family history negative. Whooping-cough at the age of three years, fol-

lowed by measles in the winter of 1901. This was followed in turn by what was believed to be bronchitis, which left her with a cough resisting all treatment and which has persisted ever since. May, 1903, had bronchial pneumonia, recovered and apparently well except for the cough. About four weeks ago child's temperature would rise about three p. m. to 102–103. This would persist until about seven p. m., when it would gradually abate. Has been greatly weakened by a persistent diarrhœa. Appetite not good. In coughing raises nothing but white, mucus-like substance; no tubercular bacilli present on examination. About this time an abscess formed in right side of chest and discharged quite freely. There was much dullness on percussion, with zones of respiratory murmur. The case believed to be one of empyema unrelieved by the sinus, and an operation advised. Sixth and seventh ribs resected, one and one-half to two inches in length, and abscess cavity opened into just above the termination of the old sinus. Quite an amount of pus escaped and cavity packed with iodoform gauze. Operation fifteen minutes, under chloroform. Bacteriological examination at the Bender Laboratory showed cocci and bacilli, and cultures showed diplococcus pneumonia. Patient improved somewhat at first, was much more comfortable, but temperature gradually increased, reaching 107.6°, then declined to 105° when she died somewhat unexpectedly. No autopsy. I believe this patient was suffering from multiple abscesses, and entire relief was not afforded.

The next case is somewhat in contrast:

I. E., age six years, came under observation January 9, 1905. September 21, 1904, had suffered pain in chest, vomiting, fever, loss of appetite and severe cold. Child treated for typhoid fever for five weeks. Previous history had always been good. Now another physician called who diagnosed empyema. Patient was sent to a local hospital where two incisions were made in side but with negative results. January 9, 1905, patient was brought to the Albany Hospital and resection of ribs determined upon, believing the child was suffering from empyema. Thorough resection of fifth rib done and cavity opened into very promptly. In introducing fingers two or three cavities were distinctly located and opened. Gauze tampon used for drainage for some few days, then rubber drainage tube, and irrigation. Respiration had been rapid but gradually dropped to twenty-four. Temperature for first few days between 100° and 100.5°, then gradually came down to about normal. This patient made a good recovery.

As a contrast to the first case of gunshot wound reported in this paper, the following is somewhat interesting:

Mr. P. S., Hungarian, age 27, during a quarrel on the night of November 2, 1908, was shot in the right side and fourth rib severely fractured. He was brought to the hospital at once, and the same day my son, Dr. Edgar, opened the wound freely, removed a good portion of the rib, recovered the bullet, found pleura quite badly lacerated, some considerable hæmorrhage and wound packed with plain gauze around rubber drainage tube. Patient somewhat uncomfortable a few days after the operation; some difficulty in breathing; temperature at one time 103°, some purulent discharge, but all these conditions abated gradually, and patient made a good recovery.

In the study of cases that have come to me, and in some of my own, I have been somewhat disconcerted by having them go on nicely after thorough resection of the ribs, but finally ending in a sinus that was exceedingly troublesome and difficult to close. For instance, Mr. D. gives a good representation of this condition, and upon this point I trust we may hear some discussion:

Mr. M. M. D., age 34, agent by occupation, had typhoid pneumonia ten years ago, followed by empyema. An abscess followed later and for eight years sinus in right side had persisted. He had kept this sinus open, which led from pleural cavity, and discharge very slight. April 24, 1907, patient very anxious for permanent relief, condition incapacitating him for work, and he wanted to get well. General condition otherwise very good. He entered the Albany Hospital and resection to the extent of three inches was done in sixth, seventh, and eighth ribs, in axillary line, right side, and quite an extensive abscess cavity was opened into. Patient went on to complete recovery, gained in flesh, returned to his work, and able to do as much as ever, but December, 1908, there was yet a sinus about four or five inches in length which would hold about one-half ounce, which would not heal under any form of treatment followed out.

In the chronic state of these sinuses I would be very glad to hear from any of our associates who have had an experience in the use of paraffin in the treatment of these cases.

In the treatment of sinuses I am quite sure that the drainage tube or method of drainage is somewhat responsible, that at times the packing is too earnest and the tube is left in too long, not granting sufficient opportunity for the expansion of the lung. Where the lung does expand rapidly a sinus is not so likely to form. This is one point I believe in favor of an early operation, therefore, I use it as an argument with the family physician to avoid delay in these cases.

In the study of my cases of empyema I have been greatly impressed to note what a large proportion occur on the right side.

As remarked, it is most impressive to note the duration of the history of cases of empyema

and their association with what might be termed a tubercular predisposition.

Mr. J. W. B., age 39, a bottler by occupation, came under observation May 18, 1903. One sister had died of tuberculosis. Sputum thoroughly examined and negative of tuberculosis.

Blood Examination. Leucocytosis 8,000, and many polynuclear leucocytes present. Patient gave a history of cough and expectoration of blood for fifteen years. Four years ago had a distinct pleurisy in left side, since which time noticed respiration had been difficult and somewhat rapid. November, 1902, contracted a severe cold and since then unable to work. His family physician made the diagnosis of empyema and did two aspirations, but with little benefit. May, 1903, an abscess was opened between eighth and ninth ribs, under ethyl chloride, and a large amount of pus evacuated. On the 19th of May another incision was made with a somewhat similar result, but his symptoms did not improve, temperature not lessened, and he was advised to enter the Albany Hospital. May 27th I did a thorough operation and found a sinus that extended to the intercostal space between the eighth and ninth ribs, which was carefully dissected out, and which had communicated with the pleural cavity. Seventh and eighth ribs resected to the extent of nearly four inches, this opening into a large abscess cavity from which a pint of pus was evacuated. A large rubber drainage tube inserted and packed about with iodoform gauze. Gauze removed at the end of forty-eight hours and abscess cavity irrigated with boric acid solution, a dram to the pint. After this operation his temperature became normal, cough ceased, appetite returned, general functions of the body became normal, and patient left the hospital at the end of the third week, improving in every respect and ultimately making a good recovery. I regret to say the hospital record fails to note and report an examination of sputum on discharge for tuberculosis. His clinical history and appearance was that of tubercular trouble.

In a number of my operations for the relief of empyema I have seen good results following the bottle method of exercising the lung to produce expansion.

SUMMARY

1. That the hypodermic syringe with a long needle is of value for exploratory purposes.
2. That the repeated use of the aspirator is not to be condemned so long as the fluid remains sterile, and is the preferable method of treatment in malignant cases.
3. That the use of the trocar and drainage tube is advisable after it is shown that the aspirator is no longer affording benefit.
4. That resection of the ribs is absolutely necessary when no improvement takes place with the ordinary drainage tube.
5. The latter operation to be done early in order to protect the lung from unnecessary pressure, and to relieve the adhesions that, in the young, become so detrimental in causing spinal curvature.

THE PRESERVATION OF DISSECTIONS OF SURGICAL ANATOMY WITH PERMANENT COLOR OF MUSCLES, VESSELS, NERVES, AND ORGANS, BY A NEW METHOD[1]

BY EDMOND SOUCHON, M. D.

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THE details of this experimental work, extending over several years, were published in the Journal of the American Medical Association on August 22, 1908, and I wish here to recall only the most salient features of this new method.

The basic condition is a proper embalming formula which will assure color. The aim is not so much to obtain the real color of the living, as that color varies in the various subjects, but to secure a marked contrast between the fleshy parts of muscles and the tendons, bones, and other white tissues, doing away with the uniform bleached appearance presented by so many otherwise beautiful preparations seen in the museums in this country and abroad.

After a number of trials, consuming over forty subjects, I have found that so far the following formula is the one that gives the best results for this work: Arsenic, 2½ gallons,

[1] An abstract of remarks before the American Surgical Association, June, 1909.

formalin, 6 ounces, alcohol, 16 ounces, carbolic acid, 6 ounces, glycerine, 16 ounces, and creosote, 2 ounces.

Very lean subjects should be used.

A feature of some importance is to allow the parts to be dissected to drain for ten and fifteen days before dissecting them. Otherwise the dissecting is rendered unsatisfactory by the infiltration of the tissues by the embalming fluid.

After the dissection is completed, it is placed in a glass jar filled with a solution of carbolic acid, one ounce to the gallon. This is changed as often as it is discolored by the blood.

We come now to the next important find, which is the placing of the dissected parts in an *empty* jar without any solution of any kind, but covered with a lid. I call this stage the curing process. It is second in importance to the embalming solution, as it develops or brings out again the color without darkening the tendons or other white tissues. It also smooths the surfaces, which may be shreddy or ragged, it sharpens the edges of the muscles, thus giving better definition. It fixes the color so as to keep it from being perceptibly affected when the specimen is finally put up permanently in a weak solution of alcohol, 20 ounces to the gallon of water.

The arteries and veins must be painted with moist water-colors, as the coloring matter used in the injecting material will not show when the preparations are preserved in solutions.

All solutions should be changed as soon as they become the least cloudy or discolored. This is essential to the permanent beauty. Otherwise the impurities in the cloudy or discolored solutions will settle on the white tissues, stain them, and destroy their whiteness and brilliancy.

Some specimens are refractory in developing color. I estimate so far that 85 or 90 per cent of the specimens turn out satisfactorily. The remainder are merely good, but not good enough to be placed in a museum, especially with one's name to it.

That uniformity of color and result does not invariably follow uniformity of procedures is due, I believe, to the fact that the chemical composition of the tissues varies with the subjects.

The great practical value of this new method is to give us the means of building Study Museums composed only of real dissections placed in very large glass jars, in spacious rooms flooded with light, on tables, so that students can come right to them and study them.

Thus the students can prepare for the dissecting room. They are assisted in their dissections by referring to the preparations in the Museum. Their work in the dissecting room is completed by showing them the great number of things which they never see in a dissecting room. They are also able to review and fix in their minds what they have really dissected themselves. Practitioners can in a few moments relearn much anatomy.

Such is the Study Museum I am now building for the Medical Department of Tulane University in New Orleans. The Museum contains 400 very large glass jars with dissections. I have now 200 good ones and there are 200 to be made over, because they can now be made better owing to the improvements in the method. It will take about two or three years to make over those 200.

THE PREVENTION AND TREATMENT OF THE SEQUELS OF PERINEAL PROSTATECTOMY[1]

By JAMES E. MOORE, M. D., Minneapolis, Minn.
Professor of Surgery in the University of Minnesota

PERINEAL prostatectomy is a life saving operation, and to read some of the literature upon the subject one would think that there are few serious complications and no unpleasant sequels, but every one who has performed it many times knows that grave complications and sequels do occur that are trying and discouraging to both surgeon and patient, and that it is a grave operation not to be lightly undertaken. According to the latest statistics perineal prostatectomy is accompanied by a mortality of a little over six per cent, and over seventeen per cent are either complete failures or are followed by some sequel that makes the operation far from satisfactory, so that in about one out of every four operations the result is either death or more or less of a failure. It would seem, therefore, that our best efforts in the future should be directed toward this twenty-five per cent. Owing to the age and ofttimes bad condition of our patients there must always be a mortality and a failure rate, but surely both are too high at the present time.

My experience is not so large as that of many of my hearers, the whole number of my operations being about sixty, but over fifty of these have been in private practice and either my private assistant or I have attended to the after treatment, and I am therefore possibly better prepared to discuss this subject than some who have a large hospital service and who see little or nothing of the after treatment. Most of my misfortunes came with my earlier cases, when the sum total of experience in this operation was small, and when my own experience was necessarily limited, but the nature of this operation and the location and importance of the parts involved are such that it is impossible for even the most experienced operators to altogether eliminate complications and sequels, some of which are so grave as to bring discredit upon the operation. The fellows of this association are all experienced operators and are now meeting with the minimum number of unfortunate sequels in their own work, but they all have patients under their care for them who have been operated by less experienced operators. The fact that operators of considerable experience are constantly changing from the perineal to the suprapubic operation, and vice versa, is conclusive evidence that neither operation is perfectly satisfactory. The present trend in the States where the perineal operation has the most adherents seems to be toward the upper operation notwithstanding its greater mortality, and if the discussion of this paper will help to demonstrate whether this tendency is due to the superior merits of the upper operation or to the unwarrantable optimism of its advocates, my effort will not have been in vain.

I am not content to accept as final the statements of enthusiastic advocates of the upper operation who have had but little experience with the lower one, because I know that along with myself there are advocates of the lower operation whose overenthusiasm has led them to hold out promises that can not be fulfilled. This exuberance has led to a portrayal of this operation as a perpetual bed of roses into which many young and inexperienced operators have fallen to their undoing and to the discredit of the operation. The only rational way to settle this controversy is for all operators to become equally proficient in both operations and to fit the operation to the case instead of fitting the case to the operation, as most operators are now doing, but judging from past experiences this is too much to expect, for to go to extremes is a marked human trait, and surgeons seem to be pre-eminently human in this respect.

Failure. According to Watson's statistics 7.4 of these operations are failures, but when the operation has been properly performed and the after treatment carefully conducted,

[1] Read before the American Surgical Association, June, 1909.

the patient should always be relieved of his pain although he may continue to suffer some inconvenience. One of my patients was obliged to continue the use of the catheter because the bladder had completely lost its tone. The patient was eighty-two years old, was suffering such constant pain that he was nearly dead for want of sleep, and was passing the catheter every hour. He had depended upon the catheter altogether for twelve years. After the operation a number thirty steel sound, or the largest sized rubber catheter could be readily passed, but from the time the drainage tube was removed no urine passed except through the catheter, but he was relieved of his pain. He called upon me some months after he left the hospital to express his satisfaction with the operation, for he was perfectly free from pain, had gained so much in appearance that I scarcely recognized him, and was about to go to California for the winter. He did not consider the use of the catheter a hardship because he was so accustomed to it, and he was only obliged to use it once in six or eight hours. This sequel seems inevitable in some cases where the catheter has been used a long time, which is a strong argument against prolonged catheter life. When a patient continues to suffer pain and tenesmus after the operation, it is usually due to a pocketed bladder, diseased kidneys, or an incomplete operation. There are some patients, however, in whom the bladder is so deformed that even after a complete operation the outlet is not sufficiently lowered to prevent some residual urine. These bladders must be occasionally relieved of their residual urine by the catheter, which should be followed by careful disinfection and by repeated doses of urotropin. In such cases the operation is far from being a perfect success, but the treatment of the cystitis can be conducted with so much less pain and so much better success after the operation, that it can not be considered a failure.

The loss of sexual power. The prostate is an important sexual organ, and its removal by any route or method is sure to have a decided effect on the procreative powers of the patient. If sterility were the only effect it would not be a very serious matter, for a man old enough to require a prostatectomy is rarely ambitious to increase his family, but not infrequently the power of copulation is entirely destroyed. It is impossible to learn just how often this undesirable result follows, because the patients are usually reticent and not infrequently untruthful concerning it, but the percentage is larger than is usually admitted. This sequel seems inevitable, and since it occurs so frequently the marvel is that it does not always follow. There is no known means of preventing this sequel and its treatment is hopeless. I question the advisability of complicating the operation by efforts to preserve the ejaculatory ducts, for it is irrational to conclude that the destruction of these ducts at this point is the deciding factor in making a man impotent, when we know that vasectomy does not do so. To very old patients and to younger ones who are in imminent danger this is a matter of little consequence, but to young, able-bodied men who need the operation to save them from the dangers of catheter life, it is a matter of careful consideration, and no surgeon should operate upon a man in this class without informing him of this possible contingency.

Injury to the rectum. If the truth were known, injury to the rectum is probably the most frequent serious complication in perineal prostatectomy. This accident often results in death, and when the patient survives he is liable to have a urethrorectal fistula, a condition which according to Watson's statistics occurred in 2.7 per cent of reported cases. The rectum was torn in two of my cases at about the middle period of my experience, when I was trying to operate under the guidance of the eye. During my earlier and my more recent experiences, when I was content with a small perineal opening and guidance by touch, after Goodfellow, this accident has not occurred. The use of tractors pulling downward is doubtless the most common cause. Watson states that in the enucleation operation the rectum is liable to be torn by pushing a lateral lobe against it when the enucleating finger is above. Packing which is too tight, or which has been allowed to remain too long is responsible for some rectal fistulæ. Injury to the rectum can and should be avoided by constantly remembering that this is the danger point, and protecting it from undue pressure

from finger, instrument, or dressings. When the prostate has been removed the rectum should always be examined, and when it is torn the edges of the mucous membrane should be brought together with fine chromic catgut, and this should be backed up by a row or two or like stitches approximating the muscular layers of the gut. This will often fail, but it succeeds often enough to justify the effort. I have succeeded in closing a urethrorectal fistula by splitting the perineum transversely up to and beyond the fistula, closing the openings into the bowel and urethra separately with chromic catgut and packing the perineal wound well beyond the seat of the fistula. The rectum was healed when the packing was first removed, and the urethral opening closed very soon afterward.

Stricture. Stricture has not to my knowledge occurred in my own cases up to the present writing, but judging from the number of patients coming to me for treatment for stricture following this operation, it is quite probable that some of the patients upon whom I have operated have gone to other surgeons for relief from their strictures. When we consider the utter recklessness with which some operators sacrifice the prostatic urethra, the wonder is that all their patients do not suffer from stricture, and doubtless many of them do. When we meet with any other traumatism of the urethra in which even a small portion of that channel is totally destroyed, we expect a stricture to follow, and our best efforts are put forth to prevent it, why then can we reasonably expect that we can remove an inch or more of it and not have the same result follow? It is impossible in this operation to avoid serious injury to the prostatic urethra, but its upper wall can and should be preserved for as long as there is an unbroken mucous surface extending from the bladder to the meatus complete stricture can not occur, and the more urethra preserved the less danger of any degree of stricture. The extensive dissections of the perineum so frequently made in this operation, especially when crosscuts are made, are necessarily followed by cicatricial contraction with the possibility of stricture. To prevent stricture as much of the urethra should be preserved as is possible, and the dissection of the perineum should be reduced to the minimum. The routine passing of sounds to prevent stricture so frequently causes epididymitis that it should not be encouraged. The treatment of these strictures does not differ from that of any other traumatic stricture. Obstructions to the flow of urine other than stricture sometimes follow prostatectomy. In these cases the bladder has not lost its tone and a catheter can be easily passed, yet the urine will not flow. This is usually caused by a piece of the torn urethra projecting into the channel and acting like a valve. Cabot states that these flaps occur at the vesical outlet and at the apex of the prostate, and advises that the third lobe be drawn out through the urethra and cut off smoothly, thus avoiding the flap.

Dribbling. Dribbling or incontinence is an occasional sequel of perineal prostatectomy, but it has not occurred in my patients. According to Watson's statistics this sequel occurs in 3.5 per cent of cases, and my immunity is doubtless due to the fact that special care has been exercised not to injure the bladder or the membranous urethra. Beaver cites the fact that the vesical side of the prostrate is covered by only mucous membrane and very attenuated muscular fibres. It is evident therefore that the bladder can be easily lacerated by the enucleating finger, and these lacerations would have a tendency to injure the sphincter action of the bladder. Instruments introduced into the bladder to drag the prostate down during the operation are a serious menace to the integrity of that organ and should be used with great discretion. I have used Young's tractor in most of my operations and have found it very helpful. When a tractor is used it should never be trusted to the hand of an assistant. The compressor urethræ muscle is unquestionably an important sphincter and its integrity should be preserved. It is quite generally believed that injury to this muscle is the principal cause of incontinence. To avoid this very distressing sequel the sphincters must be preserved. To this end fingers and tractors must be used with the utmost care lest the bladder be torn, and the compressor urethræ must be preserved by invading the membranous urethra as little as possible. The incision into the urethra for the introduction of the finger

should begin well toward the apex of the prostate and should extend into the prostatic rather than the membranous urethra.

The treatment of incontinence when once well established seems to be hopeless, but fortunately many patients who suffer from this condition for a short time are relieved by the efforts of nature.

Perineal fistula. I have been consulted by one patient with a perineal fistula which had existed for over a year. He had been operated upon by an experienced and skillful operator who had made every effort to close it without success. The patient was a clergyman under fifty years of age, and his fistula obliged him to give up his work. I referred him back to the surgeon who had operated upon him, with the suggestion that a suprapubic opening be made and maintained until the perineal opening was closed either by operation or through nature's efforts, but I have not heard the result. In a very few of my patients the wound was a little slow in healing and became quite irritated and painful. In most of them calcareous deposits were found to be the cause of the irritation, and when these were removed the wound healed promptly.

Epididymitis is an occasional sequel of perineal prostatectomy, but is usually of little consequence beyond the discomfort it causes.

In one of my cases it was so severe as to cause sloughing of the whole epididymis on one side, but the patient, aged seventy-three, eventually recovered, and his operation restored him to perfect health. Since discontinuing the use of the sound as a routine after treatment this sequel has not occurred in my experience.

RESECTION OF THE SCIATIC NERVE[1]

Neuroplasty, End Results, Exhibit of Case

By KENNETH A. J. MACKENZIE, M. D., L. R. C. P. and S., Eng.
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ALTHOUGH a great deal of work has been done in the field of surgical neurology, it is surprising how limited the general knowledge is at the present time concerning the phenomena that attend recovery of function when peripheral nerves have been destroyed or injured.

The belief is almost universal that after a divided peripheral nerve has been reunited successfully recovery takes place within a very short time; whereas, the process is very slow.

More than a quarter of a century ago Letiévant demonstrated that after division of the median nerve, moderate pressure of a blunt object, could be felt over the entire area affected. This applies to all peripheral nerves.

Letiévant believed that this phenomenon was explained by the intimate anastomosis existing between nerves; the overlapping of sensory areas, and also by vibration communicated to sensitive nerves in neighboring territory.

Until Sherrington demonstrated that the motor branches of mixed nerves carried with them afferent sensory fibers whose course could be traced through the muscles and tendons of the arm and hand, this apparent paradox was not understood. These afferent fibers are now known to account for the residual sensibility after all the sensory nerves distributed to a part have been divided.

Wonderful additions have since been made to the knowledge of this subject by a remarkable series of studies and experiments made by Head, Rivers, and Sherren. They have not only been successful in giving finality to the problem of deep sensibility, but they have placed us in possession of the knowledge that there are other sets of afferent nerves, which associated with those mentioned, through their end organs and fibers, receive and convey stimuli so definitely that their identification becomes easily susceptible of proof.

[1] Read before the American Surgical Association, June, 1909.

To those who are not familiar with this literature it may be interesting to learn that the experiments which have imparted such éclat to the joint labors of this triumvirate were made on the person of Dr. Head himself, who submitted in April, 1903, to an operation in which both the radial and the external cutaneous nerves were divided.

In proof of their painstaking methods of investigation their work on this case extended over a term of years and was published in Brain in November, 1908.

Their conclusions are that the afferent fibers in the peripheral nerves can be divided into three systems — first, those which subserve deep sensibility and conduct the stimuli produced by pressure.

Second, those which subserve protopathic sensibility. This system of fibers and end organs receive and convey painful cutaneous stimuli, and the extremes of heat and cold. These fibers regenerate rapidly after successful operation for repair of divided nerve.

Third, those which subserve epicritic sensibility.

The nerve fibers and end organs of this system endow the part with the power to respond to light touch and enable one to discriminate the two points of the compass, and also ordinary temperatures, warm and cool. Epicritic sensibility is very slow in returning.

Contrary to the accepted doctrine that sensation in its recovery spreads from the normal part over the anæsthetic area, they have proved that the reverse is the case, and that protopathic sensibility, latent for a time, develops first at the outer confines of the analgesic area, spreading slowly towards its center; in the meantime the epicritic area of sensibility remains unchanged and its outer lines can readily be defined by the cotton wool test.

With the spread of protopathic sensibility over the analgesic area the end organs become extremely sensitive, and at this stage of regeneration pressure causes not only the sense of pressure, but a sensation of bruising and contusion; prick causes intense pain accompanied by tingling, and is very widely diffused, differing entirely from the effect of prick over the normal skin, at the same time localization of the pressure point is uncertain; extreme heat and cold at this time cause painful diffused sensations without the power of discrimination of heat or cold; even when the process of regeneration and recovery have progressed thus far, the zone of epicritic sense remains absolutely unchanged.

When the diffusion of protopathic sensibility is at last complete, for a long time afterwards the affected area continues to be extremely sensitive to painful stimuli.

It is generally about this time that the epicritic sensibility begins to spread gradually over the affected area; diffusion of both in time is complete and when complete, recovery is absolute.

The supreme test of complete recovery of sensation is determined by the compass test; the appreciation of the two points two centimeters apart, applied simultaneously to the skin surface.

It is evident that after division of a nerve, regeneration and complete recovery of function must solely depend upon conduction, restored either by spontaneous healing, primary or secondary suture, or plastic device.

Protopathic sensibility appeared after successful surgical repair of the divided median nerve, within an average period of fifty-six days, and was complete within an average period of two hundred and seven days.

Epicritic sensibility, under like conditions, appeared after two hundred and sixty days and was seldom completed within less than a year's time.

It is interesting to note that protopathic sensibility can be restored under conditions in which motor and epicritic recovery are impossible, and this fact is of clinical importance because of its bearing upon the cure of those serious trophic disturbances which, very often, follow the division of nerve trunks.

That complete regeneration can take place in divided peripheral nerves after three years is held doubtful, but within this period many successful cases have been reported.

In the case reported to-day a different set of conditions exist, which must be taken into account in gauging the measure of recovery and regeneration accruing from the operative treatment.

The lines which have been tattooed on this

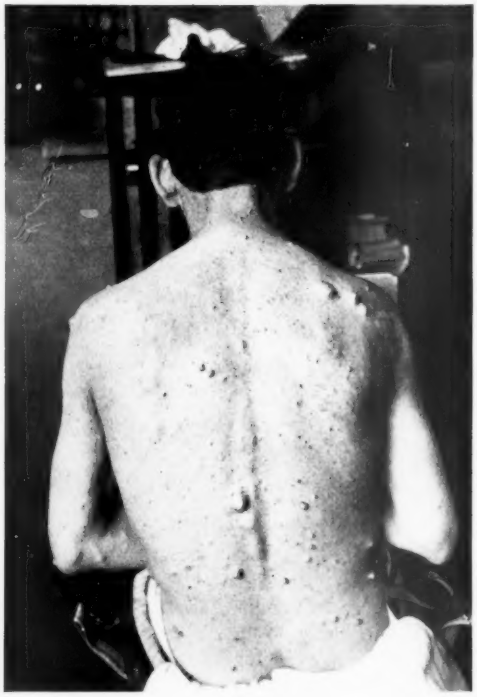

Fig. 1. Showing growth and distribution of molluscum fibrosum.

leg, show with fair accuracy the present boundaries of the different areas. The outer line bounds the whole region and the area insensitive to light touch. The line next within marks that part of the whole affected area which is insensitive to pin prick. Between these two lines is the zone of protopathic sensibility, which through its end organs and fibers receives and transmits painful stimuli and extremes of heat and cold. It is not sensitive, however, to ordinary stimuli originating with ordinary temperatures, warm or cool. (See Figure 6.)

The darker of the two shaded areas marks the region which responds to the stimuli of deep pressure which is, however, felt on both sides, shading where it is most readily felt, to the next line without, and where it is least felt into the black area; within this zone there is no response to prick and to temperatures of any degree, hot or cold.

The innermost black region marks the area of absolute cutaneous anæsthesia and analgesia — even within this area there seems to be a remnant of response to the stimuli of deep pressure.

A study of the areas of disturbed sensibility in this case brings out the fact that the small sciatic nerve was divided at the time of the enucleation of the great sciatic.

The boundaries of this area are also tattooed and show extensive protopathic recovery. (Fig. 6.)

HISTORY

George Ellsworth Carlisle, single, aged 45, height 5 feet 6 inches, weight 150 lbs. Born in Steubenville, Ohio.

Complexion dark, eyes black, hair black.

Occupation at intervals, nailmaker, hospital steward, dining car cook.

Mother and father were both Americans. Paternal grandfather was an American. Maternal grandmother was French (French provinces)

Had four brothers; one living and well, three dead, two died past age of 30, cause of death unknown. One died at 30, cause of death unknown.

Had five sisters; two living and in good health. Two sisters died before he was born. One sister was burnt to death.

His mother was afflicted with rheumatism. There is no history of consumption or other constitutional disease in his family. No member of his family is known to have had the skin disorder from which he suffers.

At birth he was strong and in childhood he had no diseases or injuries. In adult life he had pneumonia, a mild attack, uncomplicated. He has never had syphilis.

The eruption from which he suffers developed at first in 1888, when he was 25 years old. Small, round, soft tumors appeared in the center of his back, ranging in size from a millet seed to a split pea. Upon first discovery there seemed to be a large number of these growths. There were none visible at the time on the neck, face, or front of the trunk.

These little tumors grew very slowly, a few of them attained the size of a small bean. Small growths of the same kind next appeared on the forehead and temples, and in the neck, where they seemed to attain larger dimensions. Most of them were sessile, a few almost pedunculated. At this stage a few developed in the hairy scalp, but not more than three or four.

The growth of these tumors has been much more rapid during the last ten years. (Fig. 1.)

The small growths are, generally speaking, papular in form, not a few are oval, and others are circular. They are soft in texture, many of them have a yielding, velvety touch, and in a few instances the larger ones resemble in touch the soft form of lipoma.

He states that on the face and chest many of these lumps would appear and grow as large as a pin head

and then slowly disappear by absorption, leaving a brown stain. A few developed on the anterior surface of the chest.

The great majority of them are the size of millet seeds, between twenty and thirty of them have attained dimensions ranging in size from a pea to a good-sized almond. Some of the tumors are shaped like a nipple, and others are cone shaped. Considering their diffusion there is an apparent symmetry in their distribution, although the right hand is free, while the left is moderately involved.

In 1898 one of the tumors about the size of his fist was removed from the right arm above the inner condyle of the humerus. After its removal, the patient says the hand became weak and the little finger and the adjacent side of the ring finger became numb, and he could not move them, although motion returned to them two or three months afterwards, and within six months the affected hand was quite as available as the other.

At this time, while he can flex the fingers completely he cannot extend them, and there is a well marked protopathic area, showing that the ulnar nerve was divided and not reunited. One year after the operation the muscles between the thumb and index finger became atrophied.

Practically, the growths extend down the legs to the knees, but not below, and there are none on the feet.

The largest growths are, generally speaking, found on the right side of the body.

There is much staining of the skin and the staining has developed, he states, since he has had this disease.

In May, 1907, patient noticed a slight swelling on the posterior mid-region of the right thigh, which was painful, sensitive, and exceedingly tender to the touch. The pain accompanying the swelling passed away after two months, but returned in December, after it was accidently struck in climbing through a window to escape from a wrecked car.

Immediately after this injury the lump in the center of the thigh grew rapidly and became very painful. He was obliged to give up his occupation at the end of December, and by the middle of January, 1908, the pain was so severe that he could not stand or walk without great suffering. The slightest pressure over the tumor would cause the most intense local pain, which was transmitted down the leg and diffused over the foot.

The pain becoming finally unbearable he entered St. Vincent's Hospital.

Examination revealed a tumor as large as a goose egg over central part of the right thigh, over the sciatic nerve, pressure on which would almost put the man into convulsions. Locomotion was difficult and there were scattered areas on the leg of hyperæsthesia and anæsthesia; the latter, although unmeasured, were evidently in excess of the former. There was also a paretic condition of the muscles of the leg and foot on the affected side.

The diagnosis that was made at the time was: tumor, probably of analogous nature to those on the body, growing on the sheath of the sciatic nerve, which by pressure produced the motor and sensory disturbance complained of.

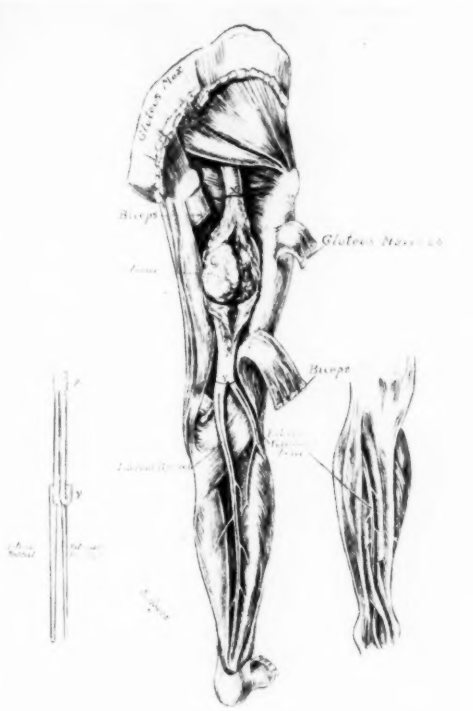

Fig. 2. Pathol. No. 9654. Diagram to show the position of the tumor, the part resected, the method of division of the internal and external popliteal nerve, and the scheme of suture.

The first operation was performed on February 4th, 1908.

A median incision was made over the tumor, extending from its upper to its lower limits. The tumor thereupon presented and proved to be the sciatic nerve with its contents, intimately adherent to the contiguous parts by inflammatory exudation, and adhesions, many recent, others well organized and dense.

The incision was extended upwards to the lower border of the gluteus maximus, and below to the center of the popliteal space.

By dissection, blunt and sharp, the sciatic nerve was finally freed and segregated. The whole nerve now resembled a large, fusiform tumor, every part of the nerve being involved

Fig. 3. Segment of sciatic nerve removed, 10¾ inches in length. Posterior view. Size reduced one-third.

and extending below well to the point of bifurcation; the external and internal popliteal branches also showing conspicuous enlargement.

Examination of the nerve carried with it the impression that the fusiform enlargement of the nerve was a tumor involving the whole nerve, and not, as it proved to be afterwards, a condition in which the nerve invested a large central tumor.

This feature was carefully investigated at the time because of the belief that the tumor was a development of molluscum fibrosum in an unusual situation.

The surgical procedure had now to be quickly determined: (1) Because of the rapid growth of the tumor (2) its infiltrated condition and its tendency to infiltrate the surrounding parts, (3) its great dimensions involving the entire area of the nerve, (4) the loss of outline of nerve structure and its evident displacement by pressure and infiltration, (5) the loss of muscular power, which was progressive, and (6) the extensive areas of anæsthesia and hyperæsthesia, not to mention (7) the great pain, mental, and nervous strain, which by this time amounted to anguish; these considerations and (8) the suggestion of malignant transformation of a benign growth, prompted me to the determination that excision of the nerve was the proper procedure.

The upper section of the nerve was made at the lower border of the gluteus maximus between the tuberosity of the ischium and the

Fig. 4. Segment of sciatic nerve removed. Anterior view. Central tumor. (Reduced one-third.)

greater trochanter, and the lower about one inch below the apex of the popliteal space.

During the resection of the nerve every effort was made to preserve any visible branches. The small sciatic nerve was not differentiated at the time of the operation. Hæmorrhage was moderate and easily controlled. The anatomic parts were then restored as carefully as possible; the wound closed in layers with iodized catgut and the skin cut closed throughout with a subcuticular iodized catgut suture. The patient returned to bed in very good condition. The first dressing was made on the tenth day and it was found that union had taken place throughout by first intention.

An inspection of the tumor showed the entire nerve hard, dense, and infiltrated, and palpation failed to reveal the outlines of a central growth. The tumor was fusiform in outline, flattened anteroposterially. Its surface showed on all sides, especially anteriorly, adhesions, recent and old. (Fig. 3.)

The outlines of the nerve tissue, excepting at the ends, were lost on account of infiltration and inflammatory exudation.

The segment removed was $10\frac{3}{4}$ inches in length, the diameter at its greatest part was about 3 inches. At both ends, where the tumor tapered from its central enlargement, the surface of the tumor was smooth and regular, but in the middle part the surface was extremely irregular and nodular throughout its circumference, showing that the growth had infiltrated into the whole tissue of the nerve between the bundles of nerve fibers, and that the tumor was not a localized growth of the sheath of the nerve in which the whole nerve was stretched over the growth intact.

Upon section of the nerve by vertical incision a tumor presented itself, oval in form, its long axis lying parallel with the axis of the nerve, consisting of an exuberant mass, somewhat dense in texture, tough, hard, and fibrous, bleeding readily on the surface on examination, and bulging rather suddenly through the lips of the incision. It measured two inches in length and $1\frac{1}{2}$ inches in its longest diameter. (Fig. 4.)

The tumor seemed to be encapsulated and intimately adherent to the nerve. It approximated on its anterior and posterior surface the periphery of the nerve, but on its lateral aspects it was densely covered by the nerve, although the effects of pressure could be noted upon the nerve in all directions, causing absorption and attenuation of structure, excepting the inflammatory tissues on the outside of the nerve, which were very dense, irregular, and exuberant.

The chart showing no variations of temperature, the dressings were removed on the tenth day and the wound found to be entirely healed. Examination of the leg showed that there was absolute paralysis of the leg, and that sensation was abolished except along the inner side of the leg corresponding to the sensory area of the anterior crural nerve. In addition to this the skin of the leg was purplish red in color and its surface was freely covered with superimposed epithelium and a few medium sized blebs appeared on the outer aspect of the leg and the dorsum of the foot. The leg was swollen and œdematous.

It is unfortunate that at this stage of the work no minute examinations were made to delimit the area of cutaneous anæsthesia.

Realizing that the leg in its existent condition was little better than no leg at all, it was determined at this time to bridge the gap in the sciatic by making a flap from the internal popliteal nerve in order, if possible, to establish a path for the conduction of motor and sensory impulses, and at the same time to promote regeneration and to avert the catastrophe of serious trophic change. Accordingly, Carlisle again appeared before the clinic on February 20, 1908, and incision was made from a point between the tuberosity of the ischium and the greater trochanter following the line of the original incision in the thigh and extending to a point immediately behind the internal malleolus. The entire length of this incision was two feet, six inches.

The central end of the sciatic was found retracted above the level of the lower border of the gluteus maximus. The ends of the popliteal nerves were now recovered, and as part of this operation the end of the external branch was implanted and sutured into the end of the internal branch (lateral).

The internal popliteal nerve, which was still enlarged, was then traced by careful dissection to the inner side of the ankle and beginning

at the level of the lower border of the internal malleolus a flap was lifted and split upwards, care being taken at every step to avoid the division of any collateral branch. The division and lifting of this flap was continued upwards to within one half an inch of the divided end of the internal popliteal.

The flap was $16\frac{3}{4}$ inches in length and its diameter a shade less than one half the diameter of the nerve. It was then laid in the bed of the sciatic nerve and, notwithstanding its length, on account of the retraction of both the divided ends of the sciatic there was little or no slack. (See Fig. 2). Its end was then implanted in a split made in the stump of the sciatic nerve and held by two very slender chromic stitches. This slender filament was about a line and a half in diameter and seemed to contain two or three fibers of the nerve. It was carefully placed over the underlying muscles and imbedded in them throughout its length by a slender iodized catgut suture.

Although the technic of the operation was somewhat elaborate, the operation was not prolonged beyond one hour's time. The anatomic parts were then carefully restored in proper relation, sutured in layers, and the entire length of the cutaneous incision closed by a subcuticular iodized catgut suture, a small cigarette drain being left in the popliteal space.

The leg was invested in a plaster cast and adjusted to the leg and thigh at an angle of 140 degrees. The first dressing was made on the tenth day, and revealed the fact that this long incision which exposed at least one square foot of surface had united throughout by first intention.

Examinations of the leg were now made from day to day and there was no change noted, but that the leg could be very feebly flexed, and it was evident that improvement had taken place in the texture of the skin, which seemed to possess better color and hereafter the tendency to the formation of blebs and ulcers seemed to gradually pass away.

Believing now that if the transplantation of a few fibers split from the popliteal nerve, bridging this large gap in the sciatic nerve, would do good by establishing conductivity and promoting regeneration, the addition of a few more fibers might augment the benefits, a third operation was done on April 7, 1908, 67 days after the first operation, and 46 days after the second operation.

The patient in the interval had been allowed to sit up and move about in a wheel-chair, and the limb was handled daily by massage, etc.

The third operation consisted in an attempt to split the external division of the sciatic nerve in order to utilize it in the same manner.

Incision was made throughout the entire length of the leg as in the previous operation. A careful inspection and dissection of the field of the first operation enabled me to note a definite path of nerve tissue established in the sciatic gap. (See Fig. 2.)

The dissection of the external popliteal was much more difficult, but it was finally traced to the same length as the internal and a flap lifted up and placed in the sciatic gap, and tucked in a separate muscular bed to the outer side of the other branch, its ends implanted into a niche previously cut in the stump of the sciatic nerve.

It was noted in this dissection that only a very moderate amount of scar tissue had formed in the line of the first transplantation. The wound was closed and dressed in the same manner as in the previous operations.

After two weeks the cast was removed for dressing and inspection, and the wound was found to have healed for the third time throughout by first intention.

Two weeks later the cast was removed and an adjustable splint applied, which permitted the leg gradually to be extended to a straight line.

Hereafter treatment by massage and electrotherapy was instituted and has been continued more or less throughout.

Examinations showed no change in the areas of sensory disturbance, but it was manifest now that the leg could be bent upon the thigh with more freedom and energy, although it was noticed there was very little muscular power in the movement.

The external appearance of the leg was at this time flabby and shrunken, the skin harsh, and of a purplish color, with a tendency in areas to the collection of epithelial scales in layers. The affected muscles of the leg and thigh became flabby and flaccid, and wasted and failed

to respond to the Faradic current, and were the seat of the reaction of degeneration. Trophic conditions, however, by this time had improved and there was now no tendency to the formation of blisters, blebs, and ulcers, although slight traumatisms had led to the loss of one or two nails of the foot. When he was permitted, after the removal of the plaster cast, to walk, there was no pain or discomfort other than what was described as a numb, heavy sensation in the leg and foot.

Attempts at locomotion showed at this stage an ability to flex the leg upon the thigh moderately, but the condition of foot drop was absolute. Whenever the leg was flexed it was promptly extended, but the foot dragged in the most helpless way, the position of the foot with reference to the leg being that of a flail.

The attitude of the foot is mentioned as showing the loss of every vestige of muscle control.

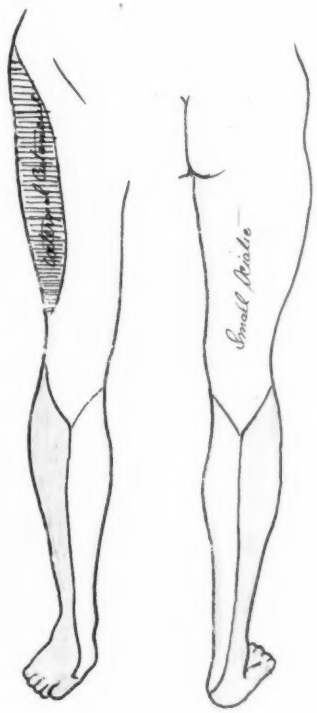

Fig. 5. Shaded area, sensory distribution (normal) of great sciatic. White area, sensory distribution (normal) anterior crural nerve.

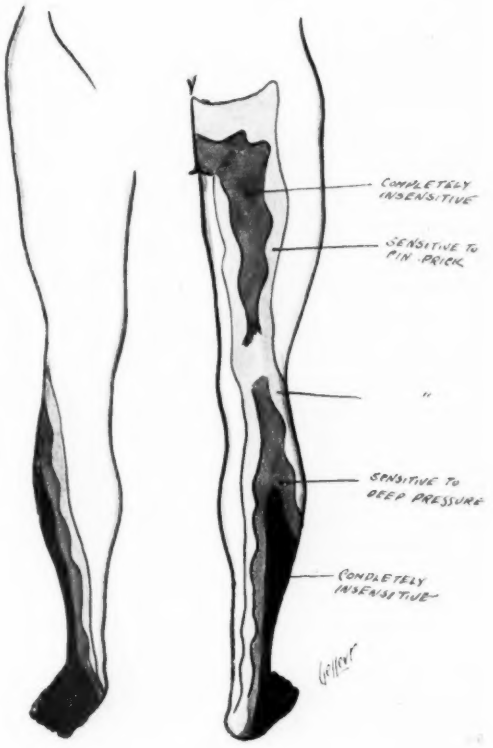

Fig. 6. The line which binds the whole affected area displays the region insensitive to light touch. The next within bounds that part of whole area insensitive to pin prick. Between these two lines is an extending zone of protopathic sensibility. Darker of two shaded areas displays region insensitive to prick, cold, heat, but sensitive to pressure. Black area is region of absolute cutaneous anæsthesia and analgesia. Note on back of thigh tattooed areas of disturbed sensibility of small sciatic nerve.

Electrical observations taken about two months after the last operation showed reaction of degeneration in the hamstrings supplied by the sciatic and also the flexors of the leg and the flexors and extensors of the foot.

Observations made four months later, that is, six months after the last operation, showed only partial reaction of degeneration of the hamstring muscles and the flexors of the leg,

but complete reaction of degeneration of the flexors and extensors of the foot.

Observations taken in April showed normal electrical recovery of the hamstrings and the flexors of the leg, partial reaction of degeneration of the extensors of the foot and complete reaction of degeneration of the flexors of the foot.

ANALYSIS OF THE EFFECT OF THE INJURY

The excision of the sciatic nerve "in toto" predicates the elimination of all motor and sensory transmission throughout the area supplied by the sciatic nerve and its derivatives. It has not been shown that by anastomosis or the over-lapping of territory the anterior crural nerve can contribute much towards the rehabilitation of a district that has been blighted by the removal of the sciatic.

Clinical evidence protests the contrary; the sciatic nerve was divided at the level of the gluteus maximus, the first fibers delivered to the hip joint were probably untouched, the muscular branches distributed to the flexors of the leg, namely, the biceps, semimembranosus, semitendinosus, and the branch to the adductor magnus were divided. These muscles afterwards wasted and showed a state of flaccid atrophy and paralysis.

It is not necessary to say that the entire area of sciatic sensory distribution, that indicated by this diagram, was entirely cut off. (See figure 5.)

It is more interesting in this study, which involves so intimately the problem of regeneration, to take into account the motor disturbance, and attention is called to the fact that in addition to the hamstring group of muscles already mentioned, the muscles supplied by branches of the internal popliteal nerve, namely, the gastrocnemius, plantaris, soleus, and popliteus, were deprived entirely of their nerve supply, and this group wasted very rapidly and promptly showed the reaction of degeneration; that the flexors of the foot, the tibialis anticus, the extensor longus digitorium, the extensor longus hallucis, the peroneus tertius, were shorn of their nerve supply and underwent the same paralytic changes; that through the external popliteal branch the extensors of the foot, namely, the tibialis posticus, the flexor longus digitorium, the flexor longus hallucis, were similarly involved, and likewise the peroneal group and all the groups of smaller muscles of the foot.

I have individualized these muscles and groups of muscles in order to afford a better grasp of the extent to which regeneration has taken place as indicated by motor recovery.

It was for a long time held doubtful that regeneration could take place in a nerve in which continuity was lost by division or excision of a segment. It is now known that regeneration will take place over short gaps without previous repair.

Hueter has pointed out that it is impossible for regeneration to take place in a nerve over a gap of $1\frac{3}{4}$ inches or more.

Victor Horsley, confirming in general the observations of Hueter, places the limit, from the standpoint of his experience, at $1\frac{1}{4}$ inches.

It is submitted in this case that a gap of $10\frac{3}{4}$ inches was made in the sciatic nerve; that immediately after the removal of the nerve, not only was all sensory and motor transmission eliminated throughout the sciatic area, but in addition all means of conveyance of stimuli by afferent nerves of whatsoever kind.

That extensive regeneration has taken place by virtue of an operation in which a gap of $10\frac{3}{4}$ inches in the sciatic nerve was bridged by two delicate flaps $16\frac{3}{4}$ inches in length lifted from the two main branches of the sciatic nerve, and that the process of regeneration is progressive, are now beyond doubt, and in proof that regeneration has taken place the evidence is listed as follows:

1. Trophic recovery is practically complete. There is now no tendency to the formation of blebs and ulcers and the skin has recovered its natural texture and color.

2. There has been extensive development of protopathic sensibility, much more than could possibly be explained by over-lapping from the district of the anterior crural nerve.

3. There has been much recovery of epicritic sensibility, as shown by comparison of the areas of sensory distribution in both legs by diagram.

4. There is almost universal recovery of deep sensation, which is said to be lost when all motor and all sensory nerves to a given part are divided.

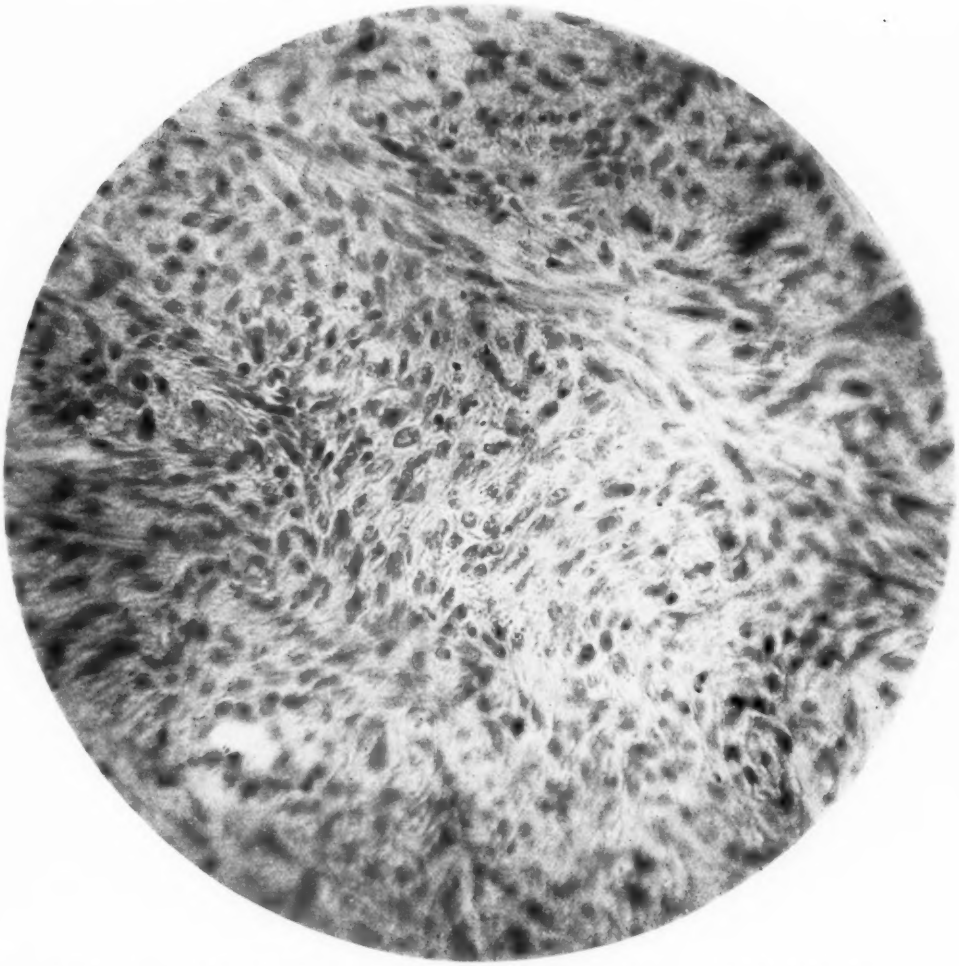

Fig. 7. Photomicrograph (by Schapiro) from section 4*a* — the tumor. A cellular area, chiefly spindle-cell sarcoma.

5. Recovery has taken place of motion and power in large groups of muscles, which immediately after the excision of the nerve were reduced to a paralytic state, displaying the usual signs of paralysis and the reaction of degeneration, viz.:

a. The flexor group in the thigh; the complete recovery of the semimembranosus, the semitendinosus, and the biceps.

b. The flexor group of the leg, the gastrocnemius, the plantaris, the soleus, and popliteus. Extensive recovery has taken place in this group and it is progressive.

c. The flexors and extensors of the phalanges and foot. Minute examination of these muscles show them now to be firm, strong, and capable of contracting, and while they do not move the foot, they control it, and there is no tendency to foot drop; some of the muscles of these groups now show only partial reaction of degeneration.

6. The sign afforded by the foot. In the

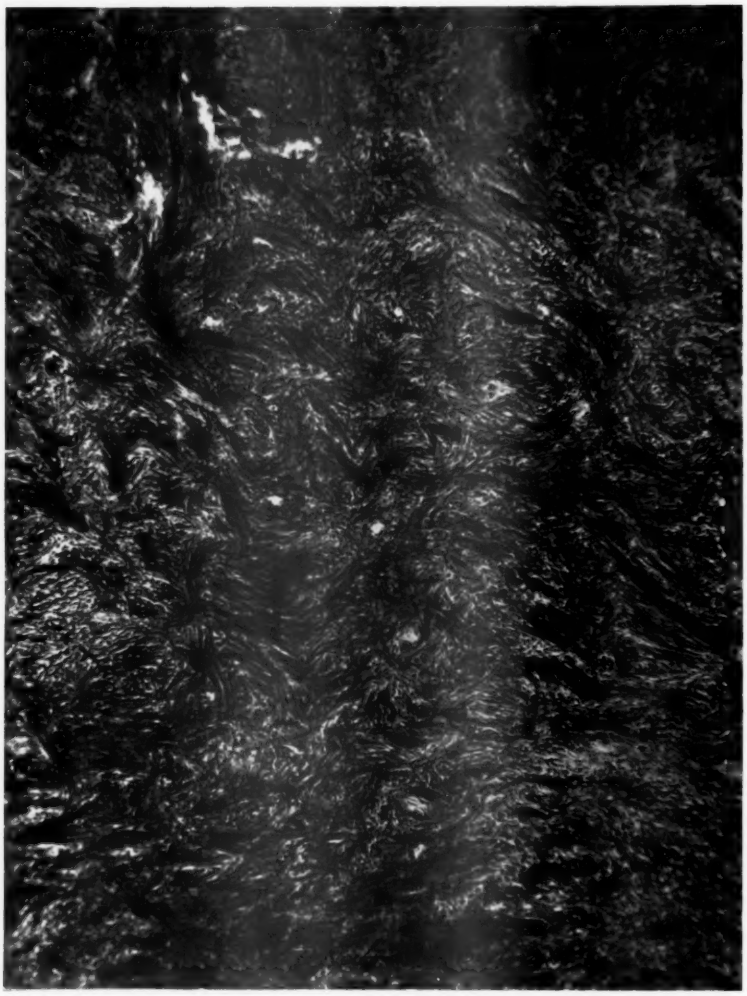

Fig. 8. Photomicrograph (by Schapiro) from section 4*b* — the tumor, showing an area in which fibrous stroma predominates; a fibrospindle-cell sarcoma (stained with Mallory and Wright).

earlier stages of locomotion the foot was helpless and dragged; at the present time it shows muscular control and easy locomotion.

7. The relatively small and contracted area of absolute cutaneous analgesia.

8. The relatively small area of thermic anæsthesia, which is practically co-terminous with the area of absolute analgesia.

9. The direct sensibility of the new nerve tract to deep pressure and the transmission of painful sensibility thereby to the foot.

10. The possession of muscular sense unimpaired.

11. Independent and unaided locomotion.

The following factors may be mentioned which have contributed to the successful results in this case.

1. Early operation, which the writer be-

Fig. 9. Photomicrograph of section 1 (by Schapiro). The upper end of the nerve near *X* in Fig. 2. *P*, perineural connective tissue; *Mx*, myxomatous "*anlage*" of the multiple fibroneuromata. (See Fig. 10.)

lieves to be imperative. It might have been better if the neuroplastic work had been done immediately after the removal of the tumor.

2. Implantation in the gap of a large "nerve element" to establish a nerve path and foundation for regeneration.

3. The infolding of the nerve flaps in muscular beds so as to prevent the destruction of the delicate nerve fibrils by early formation of scar tissue.

4. The impetus to regeneration of large and dense termini, especially at the central end.

5. The absolute asepsis in three successive extensive dissections.

PATHOLOGICAL REPORT BY DR. J. C. BLOODGOOD, BALTIMORE, MD.

The tumor of the sciatic nerve which you sent me for examination I have recorded in the surgical pathological laboratory of the Johns Hopkins Medical School and Hospital under the number 9654.

In answer to the questions of your letter of April 17, 1909, I can say that the tumor is malignant — a sarcoma. The sarcoma belongs to that variety which arises from the fixed connective-tissue cells, and in this case it undoubtedly originated in the perineurial connective tissue. It is chiefly a spindle-cell sarcoma, but there are areas in which there is a great deal of fibrous tissue. Fig. 7. Photomicrograph, Sect. 4*a*, pictures the cellular portion of the tumor, and Fig. 8 photomicrograph, Sect. 4*b*, stained with Mallory and Wright connective-tissue stain, illustrates a portion of the tumor in which fibrous tissue is in excess.

I am not prepared as yet to give you a full report on degeneration of the nerve fibres. In photograph, Fig. 9, Sect. 1, the nerve above the tumor as compared with photomicrograph Sect. 6, Fig. 11, the nerve below the tumor, one can see that some nerves pass through without degeneration. For this reason I would expect that the patient did not have complete loss of nerve function; that some of the nerve bundles were completely degenerated, is shown in photomicrograph, Sect. 3, Fig. 12. This was taken from below the gross tumor and shows a nerve bundle in which it is impossible to make out, except here and there, an axis cylinder and sheath. The perineurial connective tissue still confines the nerve fibre, but the endoneurial connective tissue is practically replaced by tumor cells and degenerated tissue.

The gross appearance of the tumor is shown

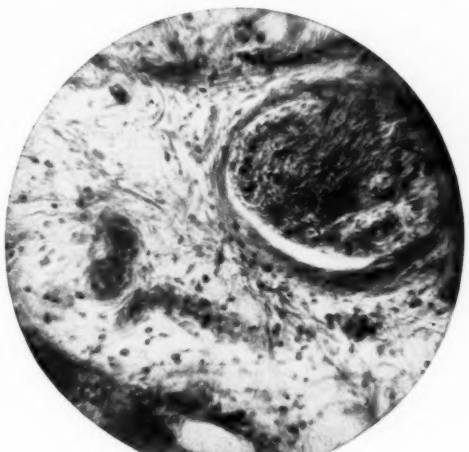

Fig. 10. Photomicrograph (high power) from section 6 (by Schapiro). See Fig. 11. This section shows the benign myxomatous tissue about the nerve which undoubtedly represents a residue or "*anlage*" from which the multiple fibroneuromata originated. One of these has developed into the sarcoma illustrated in Figs. 7 and 8.

Fig. 11. Photomicrograph of section 6 (by Schapiro) from lower end of the nerve (at *Y* in Fig. 2). *N* nerve fibre; *Mx* myxomatous "*anlage*" about small nerve (see Fig. 10).

in the sketch, Fig. 2. The tumor proper is situated in the sheath of the sciatic nerve; it has pushed the nerve aside and excavated for itself a bed. In the tumor Figs. 7–8 proper I can make out no gross or microscopic evidence of nerve fibres. This tumor (Fig. 7–8) is a fibro-spindle-cell fibrosarcoma. The growth, however, not only produces pressure upon the nerve, but there is direct infiltration into the nerve itself by tumor cells. However, both in the gross and microscopic section, it seems to me that I can trace nerve bundles through. They apparently lie anterior, if I am correct in assuming that the tumor was posterior. When a section is made through at about the level of Sect. 4, Fig. 7 (see photograph of specimen) the tumor can be seen with a semilunar shaped nerve trunk to the anterior

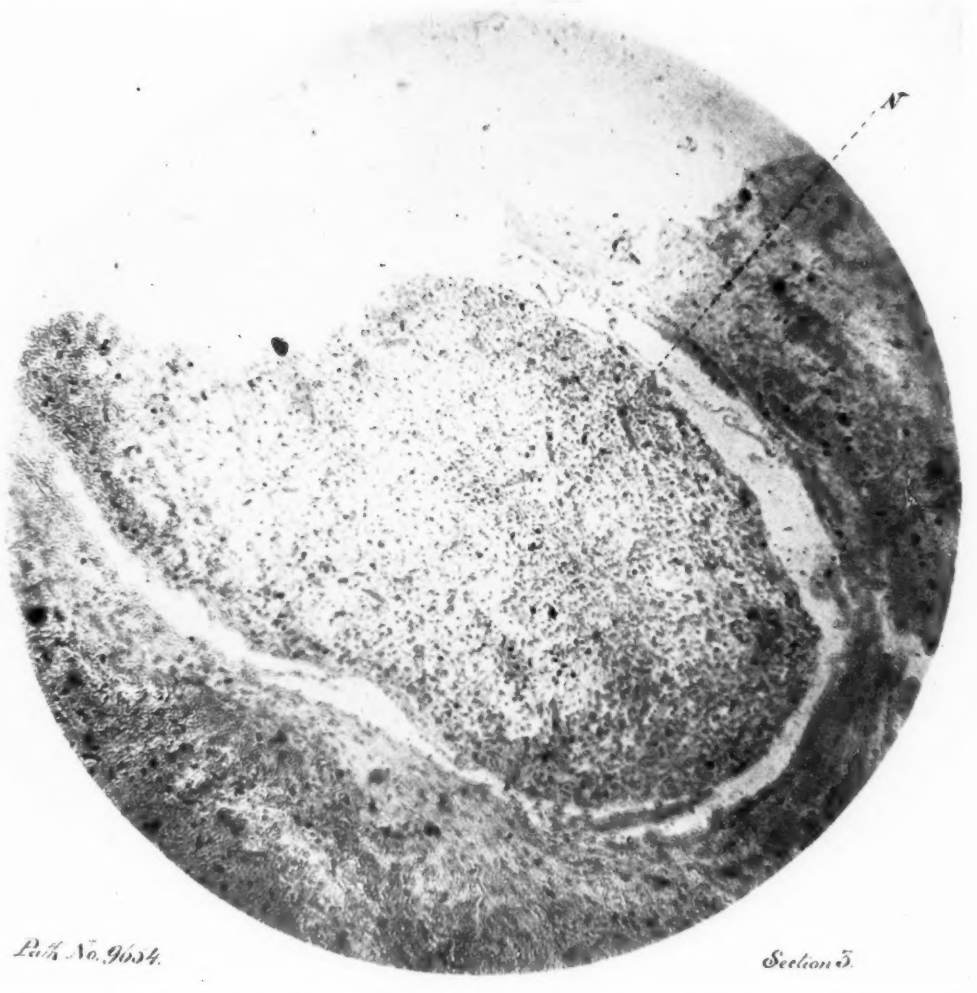

Fig. 12. Photomicrograph of section 3 (by Schapiro). From sciatic nerve near the border of the tumor. The nerve fibre *N* is infiltrated by tumor cells and most of the axis cylinders show degeneration.

side. That some of the nerve bundles are degenerated is shown from photomicrograph Sect. 3, Fig. 12, taken from the nerve trunk proper just anterior to the tumor.

Later I will be able to give you correct information in regard to the presence or absence of degeneration elsewhere. Both in Sect. 1 and in Sect. 6, illustrated in the photomicrographs, Figs. 9–10, and in Sect. 2, not illustrated, we see a cellular myxomatous tissue (MX) which probably represents the so-called "anlage" or rudiment of the tumor. In photomicrograph 6*a* we have a high power of one of these areas. (Fig. 10.)

The lower end of the nerve (Sect. 6) is considerably larger than the upper end (Sect. 1). This is due apparently to hypertrophy of the epineural connective tissue shown in Fig. 11.

and an enlargement of the funiculus of nerve fibres within the perineurium, and this enlargement seems to be due to increase in the endoneurial connective tissue.

The tumor is a very interesting one and resection was undoubtedly the only procedure that promised any hope of a permanent cure. The tumor also belongs to that large group of simple sarcoma in which cures are generally accomplished. The histology of your tumor corresponds with two observations of my own which have remained well, one six years and one three years after operation, but in another case in which the position and histology of the tumor somewhat resembled the position and histology of the tumor in your case, the patient had a free interval, first of seven months after resection, and then a second free interval of four years after amputation for recurrence.

The histological evidence of the "anlage" (Sect. 6*a*), Fig. 11, of the tumor in the sections taken from the upper and lower end of the nerve, I fear, must be looked upon as evidence suggesting a possible recurrence, but I do not think we know as yet enough about tumors of nerves to be absolutely certain as to this point.

CONCLUSION BY DR. MACKENZIE

The lessons to be learned from this case, while not manifold, are important. It tends to show that regeneration takes place from the peripheral as well as from the central end of a divided nerve.

It demonstrates that in given cases peripheral flaps will suffice when central flaps are not available.

Its most obvious lesson, however, rests in the fact which it discloses that by means of plastic operations regeneration on a large scale and recovery of sensation and motion on a corresponding scale can take place after injuries to and operations upon peripheral nerves from which segments have been removed of varying lengths, the limit established by this case being $10\frac{3}{4}$ inches.

Grateful acknowledgment is made of the valuable services rendered in the various operations and the preparation of this study by Dr. Frank M. Taylor, Dr. S. M. Gellert, Dr. E. B. Waffle, Miss Isabella Scott, and the senior members of the class in operative surgery of 1908.

NOTES ON MOLLUSCUM FIBROSUM

According to Von Recklinghausen this condition develops from the cutaneous nerves and belongs to the neuro-fibromata.

According to Ribbert the cause rests in some disturbance of normal development as a result of which there is an irregular distribution and arrangement of connective tissue elements of the nerves, permitting of independent growths.

Von Bruns includes molluscum fibrosum, plexiform neuroma, lobulated elephantiasis, pigmented moles, the soft warts and fibroma of the large nerves, under the title of elephantiasis nervorum.

Neuro-fibromata are relatively common; they grow from the ends of nerves, also from the connective tissue and perineurium, and are often traversed by nerve fibers which have been detached by the growths.

Tumors of the large nerves grow as a rule very slowly and develop in middle age.

Von Büngner states that sometimes they attack all the nerves and that in 12 per cent of general neuro-fibromatosis, fibro- or myxosarcoma develops from one or other of the nodules.

Garre describes these conditions as secondary malignant neuroma in contradistinction to primary sarcoma or glioma developing in nerves.

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THE CHOICE OF TIME FOR OPERATION FOR PELVIC INFLAMMATION OF TUBAL ORIGIN[1]

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IN considering the choice of time for operation for pelvic inflammation of tubal origin, several important and suggestive questions arise:

I. Will operation always be necessary for complete restoration of health, comfort and functional activity?

II. If operation is decided upon, will the co-incident occurrence of acute illness and operation entail more or less danger than their separate occurrence?

III. If interval operation is decided on, by what means may we determine that a safe time has been reached?

I. Will operation always be necessary for complete restoration of health, comfort and functional activity?

1. Unquestionably, the graver types of tubal infection result in pus tubes and tubo-ovarian abscesses with cystic degeneration of the ovaries and extensive parietal and visceral adhesions. They are usually due to the gonococcus, the tubercle bacillus, or to other pyogenic micro-organisms.[2] Such serious changes are prone to cause permanent invalidism unless removed by operation.

In the writer's experience this class embraces about 10 per cent of the total number of inflammatory cases.

2. In the next group, somewhat larger than the first, the tubal mucosa has been damaged, the ends of the tubes have been closed, and serum, blood or pus has accumulated. Here too, the ovaries are likely to be cystic. The destructive changes are less marked and more likely to be unilateral. In such cases relatively early removal may readily forestall further attacks and more destructive changes.

3. In a third group are cases in which the inflammatory exudate has been absorbed and the tubal mucosa has been restored to normal, but the accompanying peritonitis has been so severe as to imprison the ovary and tube behind dense sheet adhesions. The pain which naturally results is markedly increased by the added pressure incident to menstrual congestion. Such patients often require operative relief from suffering. Time or operation will frequently result in the correction of sterility.

4. In the writer's opinion, perhaps the majority of patients have their organs restored practically to the normal. Such patients include many infections of puerperal origin, the infecting organism being the colon bacillus, streptococcus, staphylococcus, bacillus ærogenes capsulatus, and a surprising number of cases of undoubted tubal infection due to the gonococcus. It is not an infrequent experience to see a puerperal woman with her pelvis choked by a cellular exudate, with or without a sharp attack of peritonitis of the powder-flash type. (Case report Mrs. Y.) Within a few weeks the exudate is absorbed, conception occurs, and in a year's time she again becomes a mother.

Nor does this appear strange when we consider that streptococci and staphylococci do very little damage to the normal mucosa. The decided reaction they cause along pelvic lymph paths is entirely analogous to the inflammatory changes in tissues near the surface. A cellular exudate is deposited and absorbed in the pelvis just as it is in the presence of erysipelas, a boil, carbuncle, or other surface inflammation, and may leave as little trace of its former existence.

Though the older teaching was to the effect that tubes, once the seat of severe gonorrheal infection, were never restored to functional activity, everyone must repeatedly have seen exceptions to that rule. (See case reports of Mrs. A. and Mrs. B.)

II. If operation is decided upon, will the co-incident occurrence of acute illness and operation entail more or less danger than their separate occurrence?

[1] Read before the American Gynecological Society, April, 1900.

The writer is firmly convinced that the separate occurrence of acute illness and operation entails much less danger to life, and a much lower percentage of post-operative morbidity than co-incident disease and operation. Briefly the reasons are as follows:

1. The patient's margin of reserve strength is materially reduced by acute illness of bacterial origin.

2. Cardiac hepatic and renal insufficiency are likely to occur with increased frequency and severity if an anæsthetic is administered during acute illness from bacterial or metabolic poisons.

3. Interference with a focus of acute inflammation is likely to spread infection and materially increase technical difficulties.

4. The disease properly treated very rarely causes death.

5. It is possible in the vast majority of instances for the patient to develop a degree of immunity which may, and as a rule probably does, lead to the actual internal sterilization of pus.

6. The safe time to remove the products of inflammation is not at the height of the attack but after it has subsided.

1. The patient's margin of reserve strength is materially reduced by severe illness of bacterial origin.

This is commonly observed and typically shown by the loss of flesh, pallor, rapid, weak pulse, digestive and urinary disturbances, prostration, and the "washed out" appearance so commonly noted in puerperal infections. It is evident that such patients may be seriously injured by any added depression whether it be caused by excessive exercise, work, anæsthetic, operation, or increased infection. It is true that not all patients suffering from pelvic inflammation are so acutely ill. In order, however, for the operator to avoid completely wiping out the margin of reserve strength above the patient's absolute needs for existence, it is essential that he should know not only what this margin is, but also to what extent it will be affected by operation. It is just as necessary for the operator to know what added strain his patient is capable of sustaining as it is for an engineer to know the tensile strength of a steel beam or cable.

2. Cardiac hepatic and renal insufficiency are likely to occur with increased frequency and severity, if an anæsthetic is administered during acute illness from bacterial or metabolic poisons.

It is well known that an anæsthetic may cause hyperemia of previously normal kidneys. Offergeld, Muller, Gideon Wells and others have shown that it may also cause fatty degeneration of the liver and of the heart muscle. It is a matter of common observation that bacterial poisons such as those of diphtheria, scarlet fever, etc., frequently produce a high grade nephritis. That serious metabolic disturbances frequently occur in the presence of anæmia, pregnancy, acute inflammation, etc., has been demonstrated by Stone and Ewing, and has been referred to by Bevan and Favill; and is shown further by the frequency with which an excess of acetone and diacetic acid are found in the urine of patients suffering from these diseases. (See case reports of Mrs. C. and Miss D.) Individually, these affections may be serious. If an anæsthetic is administered and operation done during an acute illness as an emergency procedure, these several factors will often act collectively, and prove far more formidable than any one of them acting alone.

When all the patient's structures are profoundly depressed by bacterial and metabolic poisons, they are far less able than normal structures to stand the added injury and depression of anæsthetic and strain of operation. For example, no one would think of choosing, as subjects for elective operations, patients actually ill with pneumonia, typhoid fever or scarlet fever, etc.

3. Interference with a focus of acute inflammation is likely to spread infection and materially increase technical difficulties.

If one operates during an acute attack one finds not only the original focus of infection, but also the adjacent structures infiltrated with inflammatory exudate teeming with virulent bacteria.

One is here dealing with bacteria demonstrated by the clinical picture to be in greater numbers and to have greater virulence than at the beginning of the original attack. It is well nigh impossible to prevent transplantation

to more extensively injured areas. This unwitting inoculation is as harmful as if made as a matter of deliberate intent. (See case reports of Mrs. F. and Mrs. F.) Following operation one is liable, in a considerable percentage of cases, to leave inflammatory products more disastrous than those the operation was intended to relieve.

As to technical difficulties, they are materially increased because the tissues are infiltrated, soft, and readily torn. Sutures introduced to repair injuries to the friable intestinal walls and other structures tear out readily; raw surfaces cannot be easily covered by the adjacent infiltrated peritoneum. The tissues are unduly vascular; capillary and serous oozing prevent a dry toilet and tempt one to the use of drainage. (See case reports of Mrs. G. and Miss G.)

Under these conditions, perforation, fatal peritonitis and fæcal fistula and intestinal obstruction will occasionally occur. If the patient escapes these accidents, she is still very liable to have protective adhesions and local abscesses.

4. The disease properly treated very rarely causes death.

a. Puerperal and post-abortive infections of streptococcic origin are occasionally so virulent that the infection becomes systemic before nature has an opportunity of checking its progress. Such patients may die of septicæmia within a very few days. The writer wishes to emphasize the fact that in such cases the course of infection is not usually by way of the tubes but through the soft cervix and parametrium whose dilated lymph and blood channels permit ready access to the systemic circulation. In such cases there is a true septicæmia and no type of operation could completely remove the infection. (See case report of Miss H.) This series of cases is mentioned for the purpose of excluding them from the subject under discussion.

b. Unquestionably the proper treatment for an extra tubal pelvic abscess, easily accessible for evacuation without traversing the free peritoneal cavity, should be to open and drain as soon as suitable operative conditions can be provided.

c. We come now to those cases of pelvic inflammation of tubal origin for which operative relief is decided upon. They will usually embrace cases of tubo-ovarian abscess, pus tubes, hydrosalpinx, and sacto-salpinx with or without marked cystic degeneration of the ovaries and finally those in which adhesions constitute the chief source of discomfort. It is clear that if the disease entails high mortality, it is incumbent upon us to rescue the victim from grave danger. If, on the other hand, the disease properly treated involves slight risk, it is equally evident that we may choose elective conditions for operation. The experience of gynecologists in general is in uniform accord with the last named proposition, viz., low mortality for the disease itself.

5. It is possible in the vast majority of instances for the patient to develop a degree of immunity which may and as a rule probably does lead to the actual internal sterilization of pus.

Of the pelvic inflammatory cases admitted under the writer's care into the Allegheny General and Columbia Hospitals, with an elevation of temperature and local evidences of acute inflammation, the disease itself has had a mortality of probably less than 1 per cent. The cases admitted to the hospital during an acute attack have shown an almost uniform tendency to rapid and progressive improvement. If we may consider the temperature a fair index of improvement, the degree is expressed in the following figures: In 51 per cent of acute cases the temperature reached normal in three days and remained so thereafter. In 77 per cent the temperature reached normal within ten days and remained so. In about 22 per cent of cases normal was reached in a period varying from ten days to four months. This percentage of improvement was noted in all cases admitted to the hospital, except the few fatal ones, regardless of the type of infecting organism, the nature and extent of the local lesion and the duration of the disease prior to admission to the hospital. In the writer's judgment, this reduction of temperature is caused by a more or less complete hermetic sealing of the focus of infection by inflammatory exudate which shuts the bacteria and their poisons out of the systemic circulation, and eventually leads to their

destruction. It is a well-known fact that infected culture tubes remaining in an incubator will become sterile in a short period of time. De Haan has found that tubercle bacilli in capsules introduced beneath the skin of animals die within three weeks. Now may we not liken the inflammatory process in the pelvis to the following:

A test tube containing a virulent culture of bacteria is placed in a jar of sterile culture medium. Infection of the surrounding sterile culture medium does not occur unless the protective walls of the test tube are broken. So in the pelvis, a Fallopian tube becomes infected by a small number of bacteria having sufficient virulence to overcome the resistance offered by the cells first attacked. An inflammatory exudate is thrown around the infected area and chokes the lymphatics, thus shutting bacteria and their poisons out of the systemic circulation. During this process of sealing systemic symptoms gradually subside. The bacteria, however, still live for a time and may readily reinfect the patient if the protective wall be broken (as by operation, vigorous examination, or undue exercise) and inoculation of the surrounding structures occurs. If the seal is unbroken, the bacteria will probably die within a period of a few weeks. As the protective wall of exudate is gradually absorbed the contained poisons filter into the general circulation in innocuous doses. This process gradually proceeds until the exudate is completely absorbed, when there is no longer need for its existence.[1]

In substantiation of this point the writer quotes the following authorities, and submits the following observations from his own experience.

Watkins (Surgery, Gynecology and Obstetrics, iv, p. 507). Inflammatory exudates are at the present time known to be productive agencies against the extension of infection, and they possibly play an important part in the destruction of bacteria and the limitation of absorption of toxins. Formerly the presence of pus was considered a positive indication for immediate operation. Now it is known that pus after a short time becomes sterile and comparatively harmless in the absence of secondary infection, and that finally the bacteria and the toxins entirely disappear. In most cases such a change occurs in from one to two weeks.

(The writer's experience is in strict accord with the above statement of Watkins, except that he looks upon three weeks as a minimum period for sterilization. In choosing the time for operation, he places chief reliance upon the physical findings, in association with a minimum period of three weeks of normal temperature.)

In further substantiation of this view typical charts are submitted, showing the clinical improvement. Bacteriologic examinations by Wertheim and by Proescher show the frequency with which bacteria are found in active processes, and their rarity in cases that have subsided.

An analysis of temperature records in several hundred inflammatory cases shows that regardless of the duration of illness prior to admission, regardless of the nature of the infecting organism, the structures involved, and of the extent of the inflammatory lesion, the temperature reached normal in 51 per cent of cases within four days and remained so thereafter; 77 per cent remained normal after ten days, and in the remaining cases, the normal was reached in varying periods after ten days. (All except a small number, less than 1 per cent of fatal cases.) See charts I, J, and K.

Wertheim (Arch. fur Gynecologie, Berlin, heft xlii, 1892) operating during acute attacks of pelvic inflammation, found bacteria 19 times (79 per cent) in 25 cases. (Gonococcus 16 times; streptococcus once; undetermined once.)

Proescher (Allegheny General Hospital) examining specimens from 40 of the writer's cases operated on after the subsidence of the acute attack, found microscopic examinations negative in all cases. Cultures were sterile 38 times, and showed the presence of bacteria twice (staphylococcus albus once, and colon bacillus once). All mice inoculated are still living. It will be seen that bacteria were

[1] Forssner (Archiv. fur Gynecologie Band 83, Nr. 2, 1907, S. 447) whose results fairly represent those of competent gynecologists elsewhere, reports from the clinic at Stockholm, 1555 cases of pelvic inflammation conservatively treated with eight deaths, approximately 5 per cent mortality from the disease itself. The writer believes that the death rate in competent hands should not exceed 1 per cent.

found in only 5 per cent of the writer's interval cases.

6. The most favorable time to remove the products of inflammation is not at the height of the attack, but after it has subsided.

In interval operations in general one finds that organs which probably would have been sacrificed during an acute stage may be restored to complete functional activity.

The patient's margin of reserve strength is at its maximum; the structures are less friable and less easily injured — they are less vascular — oozing is slight and of little consequence; the field of operation is likely to be sterile; infectious material is less apt to be distributed; peritonitis, adhesions and other inflammatory complications are less likely to occur. The elimination of such post-operative complications materially reduces danger of life. The writer's experience, 456 (up to April 11, 1909) consecutive sections for the removal of products of pelvic inflammation, with 3 deaths, leads him to believe that the death rate in interval operation should not be higher than that of inflammatory abdominal work in general. It should approximate 1 per cent.[3]

III. If interval operation be decided upon, by what means may we determine that a safe time has been reached.

It is the writer's belief that a safe time may be chosen with almost mathematical precision by strictly clinical methods. For a number of years his decision has been made in accord with the following rules:

1. The patient shall have recovered from her acute illness, and shall have regained a satisfactory margin of reserve strength.

2. The temperature shall not have risen above normal a single time for a minimum period of three weeks.

3. The inflammatory exudate surrounding the focus of infection shall have been completely absorbed.

4. There shall have been no marked or persistent rise of temperature following a careful bimanual examination.[4]

FOOT-NOTES

[2] See reference on p. 45. In the series of 465 consecutive abdominal sections for inflammatory troubles of tubal origin forming the basis of this paper, the following operations were done:

Hysterectomy	123
Both ovaries and tubes	73
One ovary and both tubes	77
One ovary and one tube	71
Both tubes	7
One tube	16
Minor operations on ovaries and tubes or adhesions freed	98

Other operations in association with the above procedures were as follows:

Appendix removed	177
Plastic work	109
Round ligaments shortened	75
Ectopic pregnancy removed	15
Fibroid tumors removed	21
Gall-stones removed	6
Hernia repaired	3
Intestinal repair required	3
Hysterectomy for carcinoma of fundus	1
Ovarian cysts removed	6
Stone in ureter	1
Adenoma of breast	1

Proescher has studied 97 of the above specimens with reference to the recent work of L. Pick. (Berliner, Klin. Wochenscrift, 1908.) The latter has found that what appears remarkable in the mucosa as a pyogenic membrane in old pus tubes is the great reduction in polymorphonuclear leucocytes. The transformation of the mucosa into a pyogenic membrane with many polymorphonuclear neutroplules is more apparent than real. There appears a new and peculiar cell formation, distinctly in contrast with the leucocytic and lymphocytic elements. These are large epithelial-like, round or rather polyhedric light cells, situated isolated or in groups, in columns or in irregular masses. The nuclei are like vesicles — the protoplasm is in the most characteristic manner covered with extraordinarily fine and evenly round spaces. The cell body appears finely granular, light gray, and under high power shows a fine honeycomb appearance.

These cells appear confined to the mucous membrane. Old purulent foci also have an analogous structure.

The nature of these cellular elements is best studied by polarized light, — whereby it is seen that they probably contain a substance with double refraction. To a large extent the cells are filled with characteristically short and thick crystal needles. These resemble fat in staining with Sudan III and Scharlach R., but they do not stain with osmic acid. Pick believes that these structures occur in physiological as well as in pathological conditions.

The 97 cases examined histologically by Proescher show:

Gonorrheal infection demonstrably present in 29 (29.8 per cent).

Gonorrheal infection probably present in 3 (3 per cent).

No diagnosis possible in 63 (64.8 per cent).

Tubercular salpingitis, 1 (1 per cent).

Endothelioma, 1 (1 per cent).

Of 90 cases examined for refractile substances, many refractile bodies were found in 18 (20 per cent).

Few refractile bodies were found in 35 (38.8 per cent).

No refractile bodies were found in 37 (41.1 per cent).

Gonorrheal infections together with many refractile bodies found in 7 cases.

Gonorrheal infections together with few refractile bodies found in 8 cases.

Gonorrheal infections with no refractile bodies found in 6 cases.

Refractile bodies with no diagnosis possible occurred in 29 cases (7 showing many of these and 22 cases only a few).

51.7 per cent of cases with demonstrable gonorrheal infection showed refractile substances.

20.6 per cent of cases with demonstrable gonorrheal infection showed no refractile substances.

27.7 per cent of gonorrheal cases have no record of this substance.

[3] Of the writer's series of 465 consecutive abdominal sections for inflammatory trouble of tubal origin, 3 died; 6 were critically ill; 17 were seriously sick; 12 had stitch abscesses; 3 had fæcal fistulæ; 1 had intestinal obstruction; in 16 convalescence was not normal, there being cellular exudate about the pedicle intestinal adhesions, etc.

Fifty-four remained in the hospital more than 5 weeks after operation.

[4] The following would seem a fair interpretation of the rise of temperature following a bimanual examination.

a. When pressure is made upon a partially sealed focus containing toxines, a dose of variable size is as truly injected into the lymphatic circulation as if tuberculin were placed beneath the skin by a hypodermic needle. We would naturally expect just as definite and characteristic a rise in temperature. An analysis of 115 cases shows that in over 80 per cent the maximum effect of toxines thus injected is reached during the first two hours. The effects have practically disappeared within four hours.

b. If living bacteria, as well as toxines, be injected, a fresh infection is likely to occur and to be followed by a persistent rise in temperature.

It seems clear that if the slight traumatism incident to a bimanual examination causes a decided rise in temperature, the greater injury of operation would be followed by a sharp inflammatory attack.

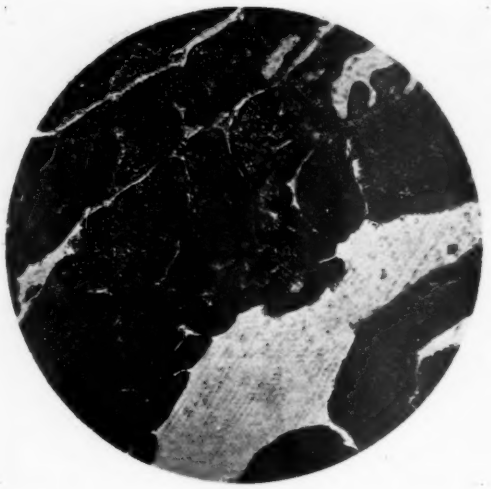


Photo-micrograph No. 1. Gonorrheal pyosalpingitis. (Ocular 4, objective 2.) Stained with pyronin, methyl green.

Photo-micrograph No. 2. Gonorrheal pyosalpingitis. (Ocular 4, objective 4.) Stained with pyronin methyl green.

Photo-micrographs Nos. 1, 2, and 3 show lymphoblasts, plasma cells and lymphocytes, which Proescher has found characteristically present in catarrhal and purulent gonorrheal salpingitis, but not in hydrosalpinx nor inflammatory conditions of other origin.

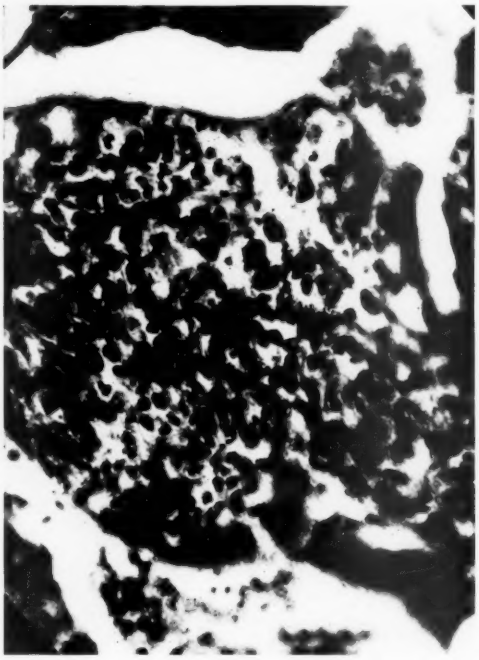


Photo-micrograph No. 3. Gonorrheal pyosalpingitis. (Ocular 4, objective 7.) Stained with pyronin, methyl green.

Photo-micrograph No. 4. Pyosalpinx. (Ocular 4, objective 6.) Stained with eosin-hæmatoxylin.

Epithelial-like cells filled with cholesterin crystals. (These cells also contain the substances with double refraction, as abscess in the following photographs.)

Photo-micrograph No. 5. Pyosalpinx (higher power of photo-micrograph No. 4.) Stained with eosin-hæmatoxylin. Epithelial-like cells contains cholesterm crystals. The cells shown in the two above photographs (4 and 5) also contain substances with double refraction as shown in the following photographs, (6, 7 and 8).

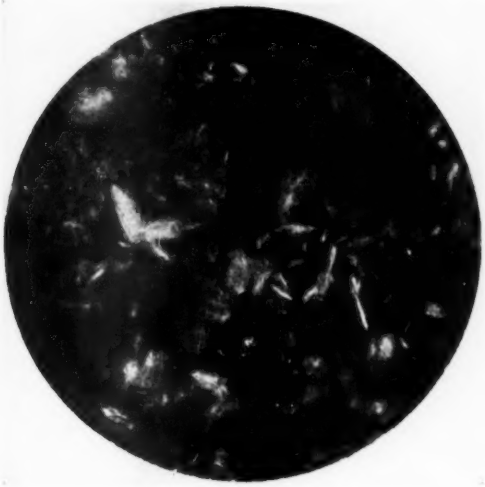


Photo-micrograph No. 7. Pyosalpinx. (Ocular 4, objective 6.) Double refraction.

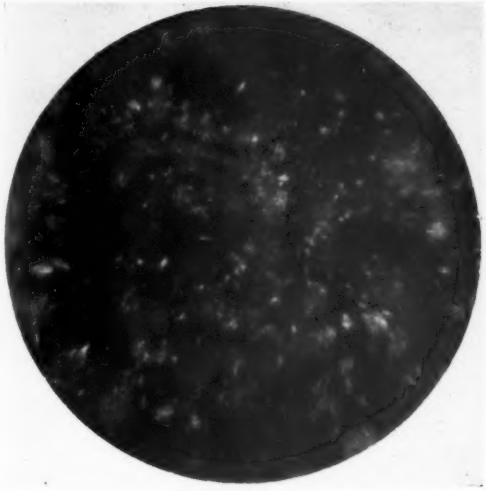


Photo-micrograph No. 6. Pyosalpinx. (Ocular 2, objective 4.) Double refraction.

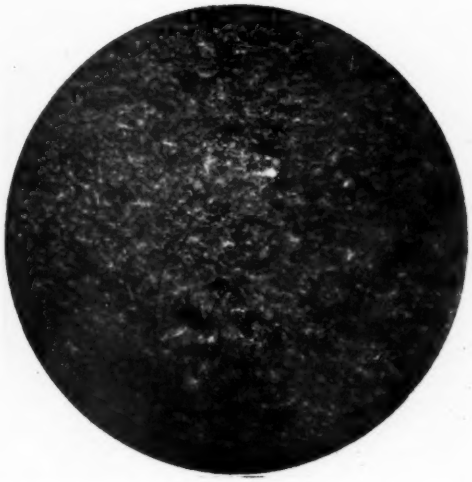
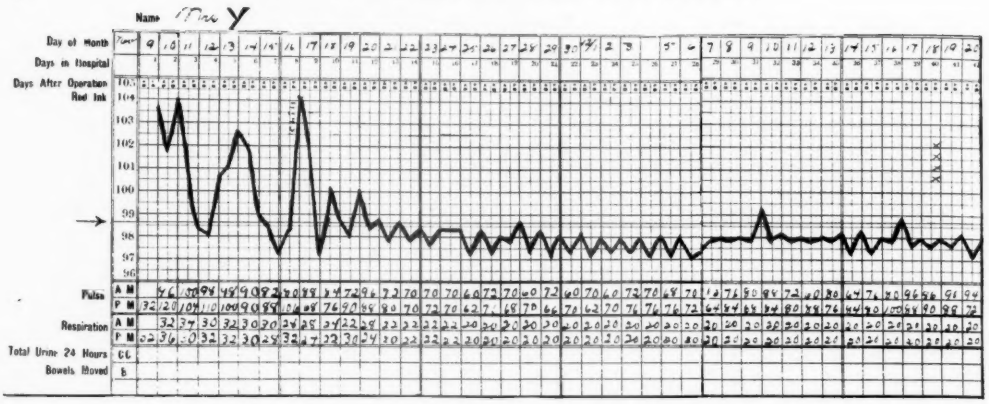


Photo-micrograph No. 8. Pyosalpinx. Frozen section in glycerine. Same specimen as No. 6 and 7 in ordinary light. (Ocular 4, objective 4.)



CASE REPORTS

Mrs. Y. was admitted to the Allegheny General Hospital, November 9, 1907. She had been confined at her home amid very unsuitable surroundings, 10 days previously. On the third day she had had a chill and an abrupt rise of temperature. On admission she had a mild attack of pelvic peritonitis; her temperature was 105½° and her pulse 132. The temperature fluctuated widely for a week; three days later it became normal and remained so. March 30, 1909, 16 months after her previous admission, she again entered the hospital, 9 days after delivery. This time she was suffering from a more severe attack of pelvic peritonitis. The attack gradually subsided, and she is now making a rapid recovery.

a. Mrs. A. was admitted to the Allegheny General Hospital, March 13, 1907, suffering from an acute attack of endometritis, salpingitis and plevic peritonitis of gonorrheal origin. The husband admitted having gonorrhea at the time. Numerous gonococci were found in the cervical discharge. She was in the hospital 55 days, during which time the temperature remained near normal and the inflammatory exudate was slowly but progressively absorbed. Three and one-half weeks after leaving the hospital she returned suffering from an acute attack of appendicitis. Thirty days later an internal appendicectomy was done. At operation a few slight cobweb adhesions were found between the tubes, ovaries and broad ligaments. They did not in any way constrict the tubes. Convalescence was normal. About eight months later she conceived; she was examined in the 6th month of her pregnancy and was found to be perfectly healthy.

b. Mrs. B. had been recently married, and was infected with gonorrhea. She promptly developed endometritis, salpingitis and pelvic peritonitis. The uterus was retroverted, and both ovaries and tubes were in the cul de sac. Dense inflammatory exudate surrounded these structures, and they were as firmly fixed as if plastered into the cul de sac. Many gonococci were found in the cervical discharge. She ran a severe course of salpingitis and pelvic peritonitis. For a number of weeks the temperature ranged about 102°. At the end of five months she was allowed to get out of bed. Her family physician persisted in local treatment for about a year, at the end of which time we succeeded in replacing the uterus, and adjusting a comfortable pessary; within six weeks she conceived and in due time gave birth to a healthy child. Examination 2½ weeks after delivery showed involution to be progressing normally. The uterus was in anterior position and the adnexa perfectly healthy.

Two cases of post-operative acidæmia with coma.

a. Mrs. C. was admitted to the Allegheny General Hospital, March 24, 1908, with salpingitis and a rupture tubal pregnancy. She was operated upon March 30th. Fifteen hours later she became very restless and tore the dressings from the abdominal wound several times. At the end of about 3 hours more she became comatose and remained so for twenty-four hours. She vomited frequently (14 times in the first 36 hours after operation.) The tongue was furred and the breath had the markedly heavy sweetish odor characteristic of a high-grade acidæmia; alkalies were given freely. She returned to consciousness, and made a speedy and complete recovery. Unfortunately the records do not show whether or not a urinary examination for acetone bodies was made in this case. The clinical picture, the odor of the breath, and the rapid subsidence of symptoms under alkaline treatment, all help, however, to make us feel strongly that we were dealing with a case of acidæmia.

b. Miss D. was admitted to the Allegheny General Hospital, January 1, 1908, with a severe attack of pelvic peritonitis due to gonorrheal pus tubes. At the end of 93 days she seemed to be in favorable condition for operation. Accordingly, the diseased structures were removed. About 15 hours after operation she became exceedingly restless and almost completely unconscious. Her urine contained acetone in excess, and diacetic acid. Within 24 hours more she became comatose, and remained so for about four days. She regained consciousness, but her improvement was gradual at first. She was discharged from the hospital in good condition about 5½ weeks after operation.

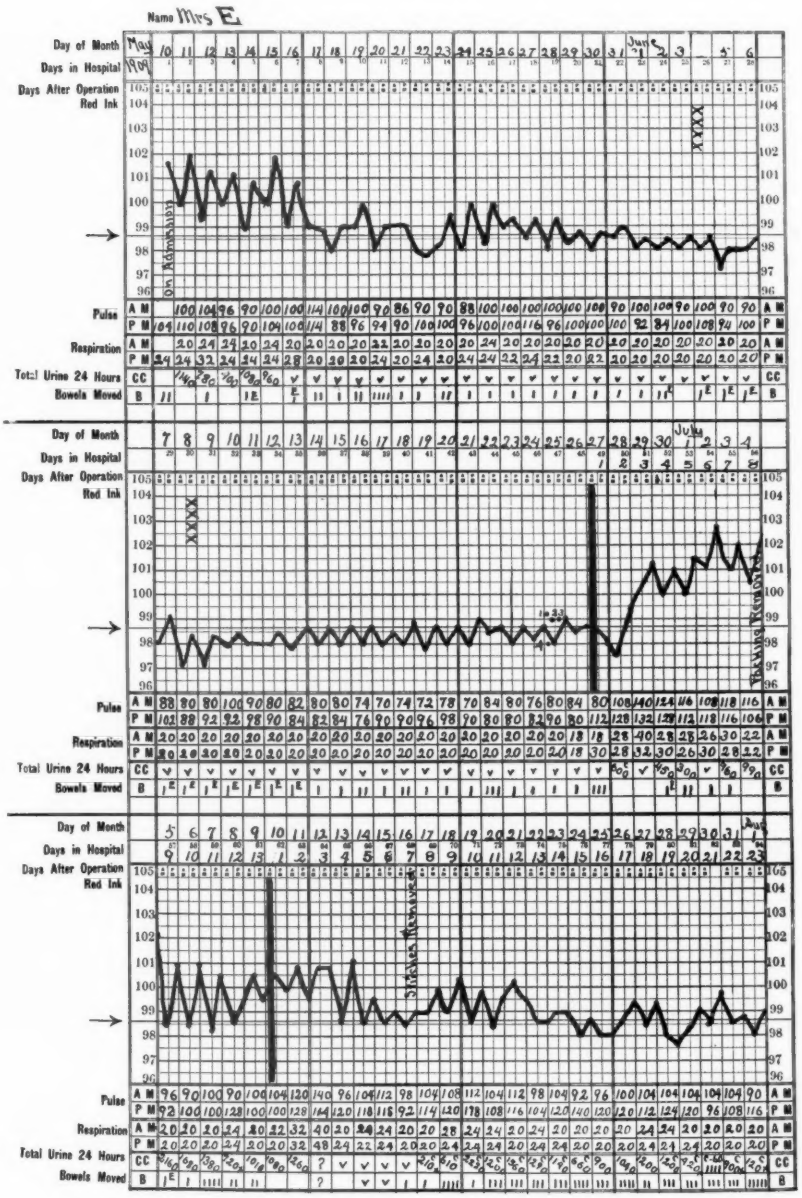
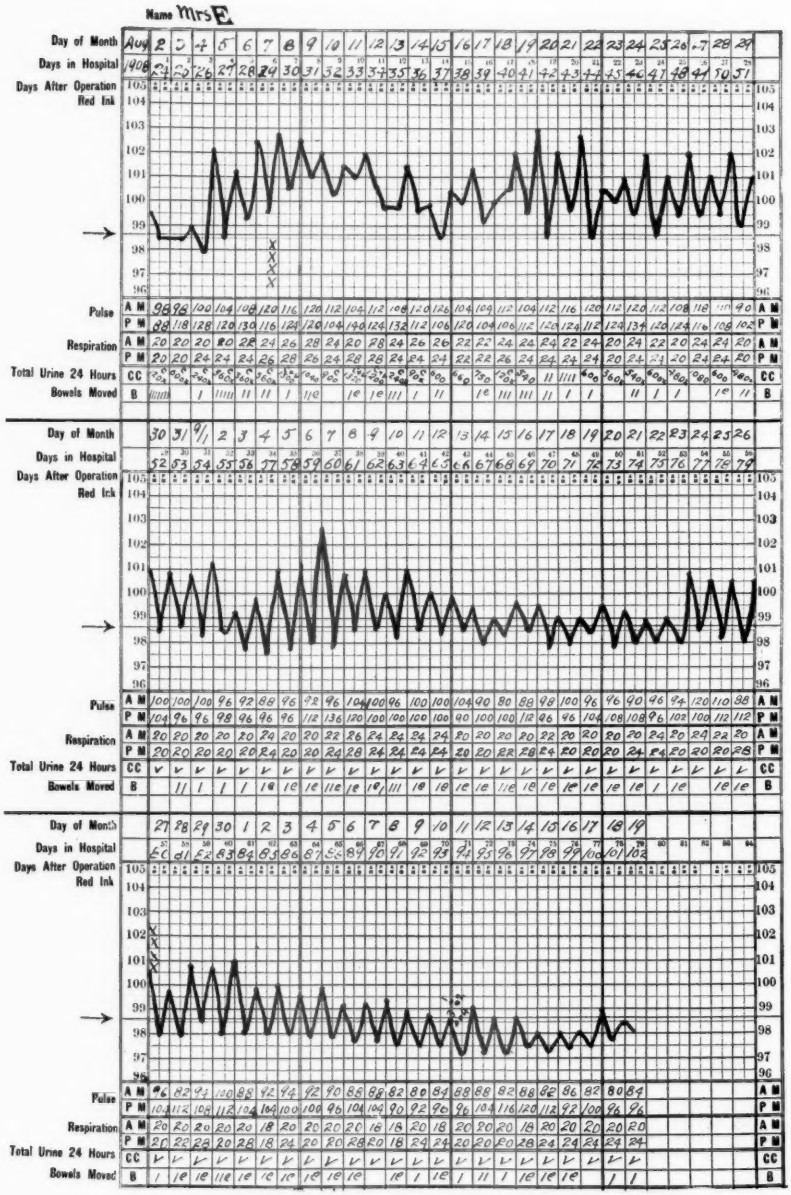


CHART OF MRS. E.

Explanatory to chart: First heavy vertical line indicates operation. Second heavy vertical line indicates opening of stitch abscess. Crosses indicate menstruation.



Mrs. E., *continued.*

In an exceptional case one finds it difficult to recognize an existing inflammatory exudate which is inaccessible to touch.

Mrs. E., a large woman, with thick abdominal walls, was admitted to the Allegheny General Hospital, May 10, 1908, suffering with a severe attack of pelvic peritonitis, due to a right-sided pus tube, and left tube ovarian abscess, with cornual inflammatory nodules and an extensive inflammatory exudate surrounding these structures. Her temperature reached normal within a week and remained practically so until the time of operation, 49 days after her admission to the hospital. At this time the cellular exudate had gradually disappeared. Examination on the 47th day showed an absence of inflammatory exudate at all points accessible to the touch. Owing, however, to the thickness and rigidity of the abdominal wall, we did not palpate the posterior surface of the uterus. The organ was found, however, to be freely movable, and this fact was taken as sufficient evidence that acute inflammation had completely subsided. The general appearance of the patient made me feel like postponing the operation still longer, but she was insistent, and in the absence of any positive contra-indication operation was performed. On opening the abdomen, we found the destructive changes of the uterus and adnexa above referred to. Adhesions were universal. The inflammatory changes had completely subsided, except for an acute area binding the uterus to the rectum, a condition which was not recognized before operation because it was inaccessible to touch. The uterus, the left ovary and tube, and the right tube were removed and cul-de-sac drainage established. The patient was critically ill for a few days following operation, and for three months afterward. As shown in the accompanying chart, her convalescence was a stormy one.

In striking contrast to Mrs. E. is the case of Mrs. F. On admission she was toxic, weak, emaciated, with inflammatory masses on each side extending as high as the umbilicus. At that time they were not accessible for evacuation without risk of opening the free abdominal cavity. On the 10th day a pint of pus was evacuated through the anterior abdominal wall. Her condition was practically unchanged thereby. On the 26th day a pint of pus was evacuated through the cul-de-sac. There was gradual but progressive improvement thereafter. The afternoon temperature reached normal for the first time on the 67th day. On the 91st day she was permitted to go home for a time, on condition that she would come back to the hospital if her symptoms returned. At the end of two months she returned to the hospital in almost as bad condition as when first admitted. In about five weeks the temperature again reached normal and remained so for a like period of time. She had regained her normal reserve strength. At this time the inflammatory masses, and all pelvic cellular exudate had been completely absorbed. There was no rise of temperature following examination. All conditions seemed favorable for a safe operation, which was done 7½ months after she first came under observation, and ten weeks after her second admission to the hospital. The uterus, left ovary and tube, right tube and appendix were removed. Convalescence was without incident and recovery complete. She left the hospital 33 days after operation in satisfactory condition.

Mrs. G. was admitted to the hospital, October 3, 1908, with gonorrheal pus tubes and low grade pelvic inflammation. At the end of 19 days conditions seemed favorable for safe operation. Extensive adhesions were separated, the uterus, both tubes and appendix were removed. The tissues were vascular and annoying oozing necessitated drainage. On two separate occasions, viz., 5th and 17th days after operation, partial intestinal obstruction with fæcal vomiting occurred. Both times it yielded promptly to lavage and the use of bismuth for relieving excessive peristalsis. Immediate operation was not done because the obstruction was probably incomplete and was evidently due to adhesions. The adhesions protected the general peritoneal cavity from an infected area. To separate these adhesions, thereby releasing the obstruction, would probably result, it seemed, in a general peritonitis. We, therefore, preferred to wait until the gauze was removed, the cavity closed, and elective conditions for operation existed. Forty-four days after the first operation the abdomen was opened a second time and a band of adhesion, partially constricting the bowel was released. Her convalescence was uninterrupted. She was out of bed the 12th, and went home the 18th day after operation.

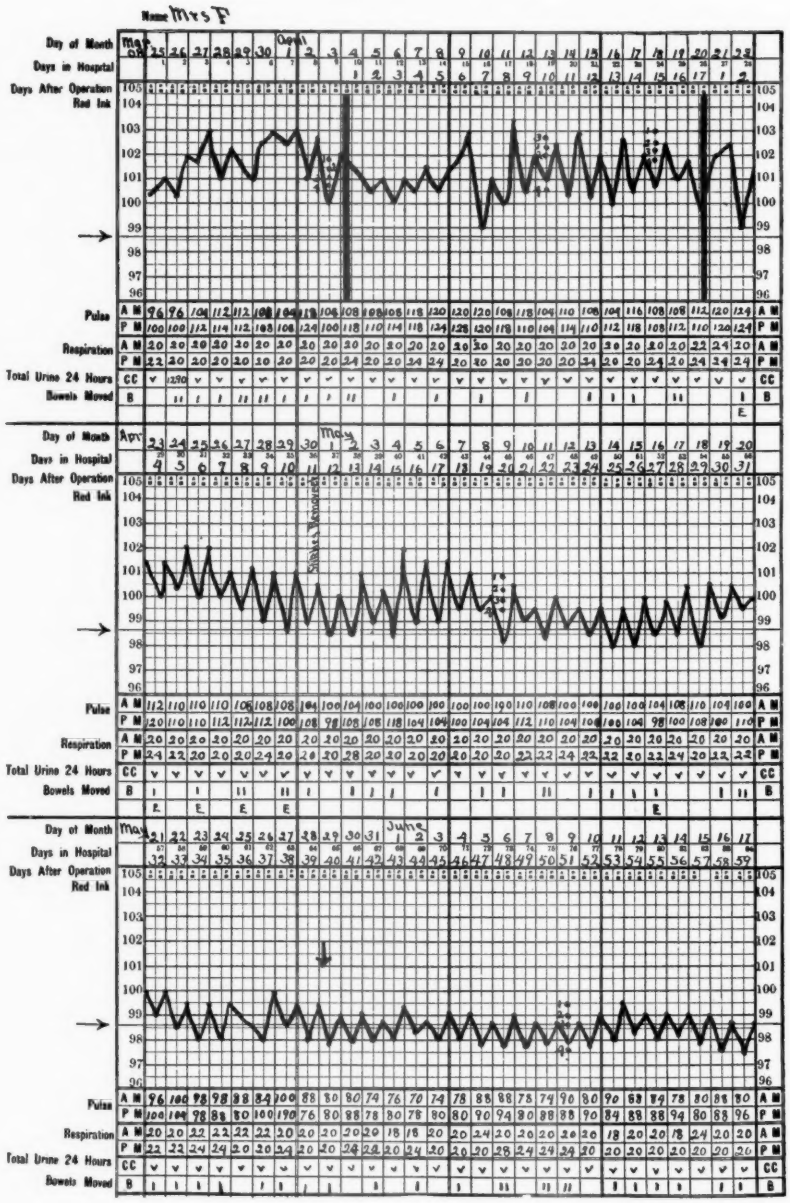
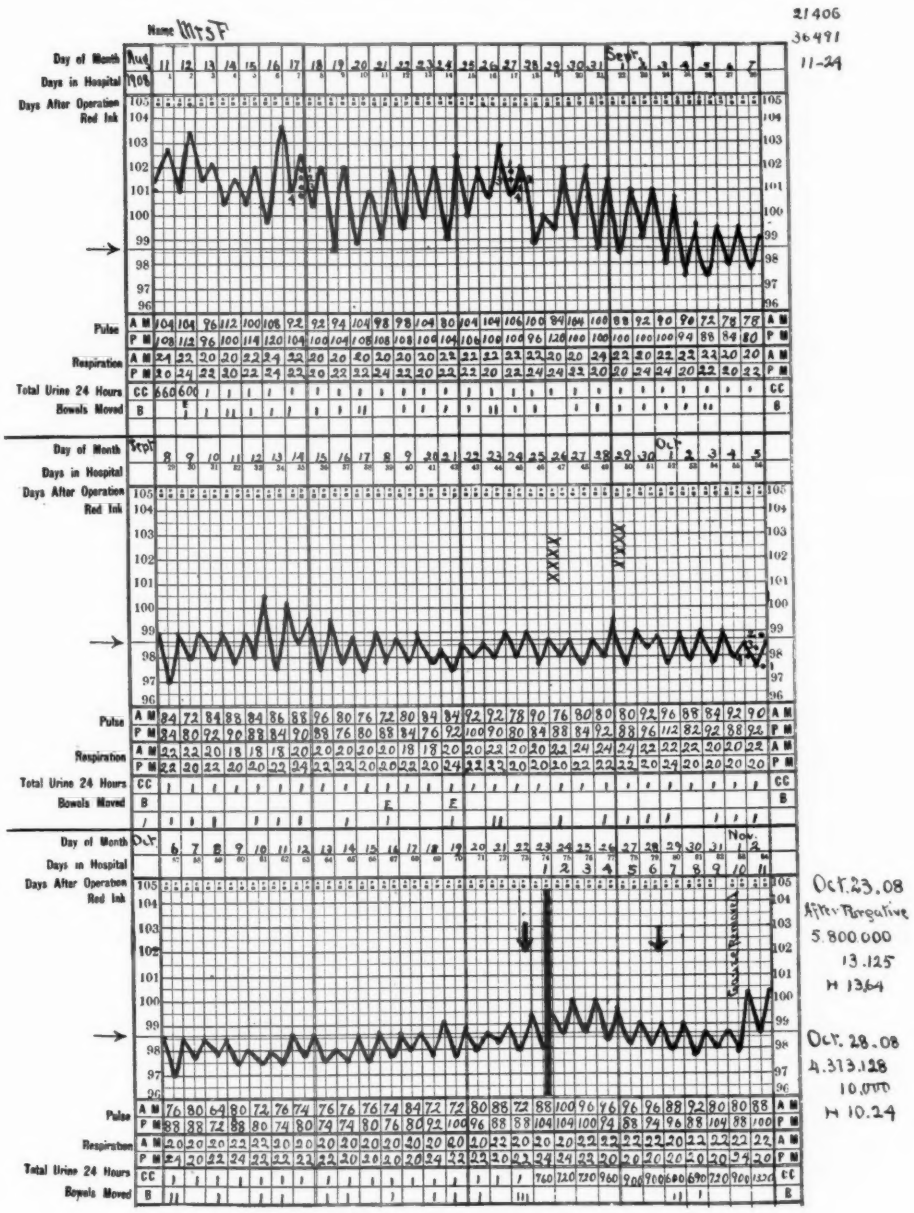
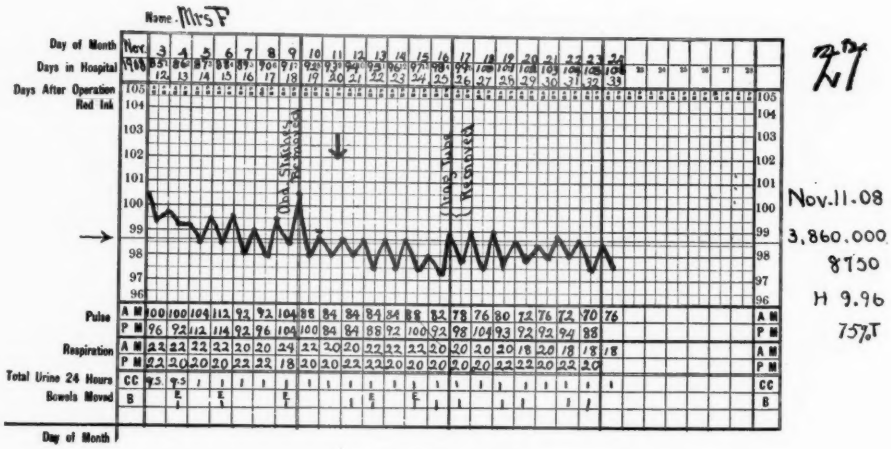


CHART OF MRS. F.

Explanatory notes: Heavy vertical lines indicate operation. The dots with figures from 1 to 4 at side indicate temperature recorded hourly after bimanual examination. Crosses indicate menstruation. Arrows indicate times at which blood counts were made.



Mrs. F., *continued*



Mrs. F., *continued*.

Miss G. was admitted to the Allegheny General Hospital, November 2, 1908, with gonorrheal endometritis, salpingitis and a mild adhesive pelvic peritonitis.

As is usual with pure gonorrheal infection of the tubes, her temperature rarely reached 99°, and she never seemed ill. Examination showed a dense inflammatory infiltration surrounding the left tubo-ovarian abscess and right pus tube. Eleven weeks elapsed before the local lesion had improved sufficiently to make removal of the irreparably diseased structures seem safe.

January 10, 1909, the uterus, left ovarian abscess, both pus tubes and appendix were removed. Convalescence was normal, recovery complete, and she left the hospital well 27 days later. Pelvic and abdominal examination made April 16, 1909, showed the field of operation to be perfectly normal.

Mrs. H. was admitted to the Allegheny General Hospital, February 27, 1908, two weeks after a self-inflicted abortion. Her temperature was about 103 and her pulse 120. The uterus was about five inches in diameter and contained a decomposing piece of placenta 2½ inches in diameter. It was removed, the uterus curetted, and bacteriologic examination of scrapings made. Staphylococci were found. During a period of 56 days she had almost as many chills, with temperature that varied from normal to 104, 105, or 106, and on one occasion 108. At no time was there any cellular exudate in the pelvis, or other physical evidence of local inflammation. At the end of about 30 days she developed a small abscess in the right lung and later abscesses in both parotid glands. Fifty-six days after admission to the hospital, she died. Autopsy showed the uterus, tubes, ovaries, and pelvic vessels to be absolutely normal. The only lesion found in her body was a small pulmonary abscess.

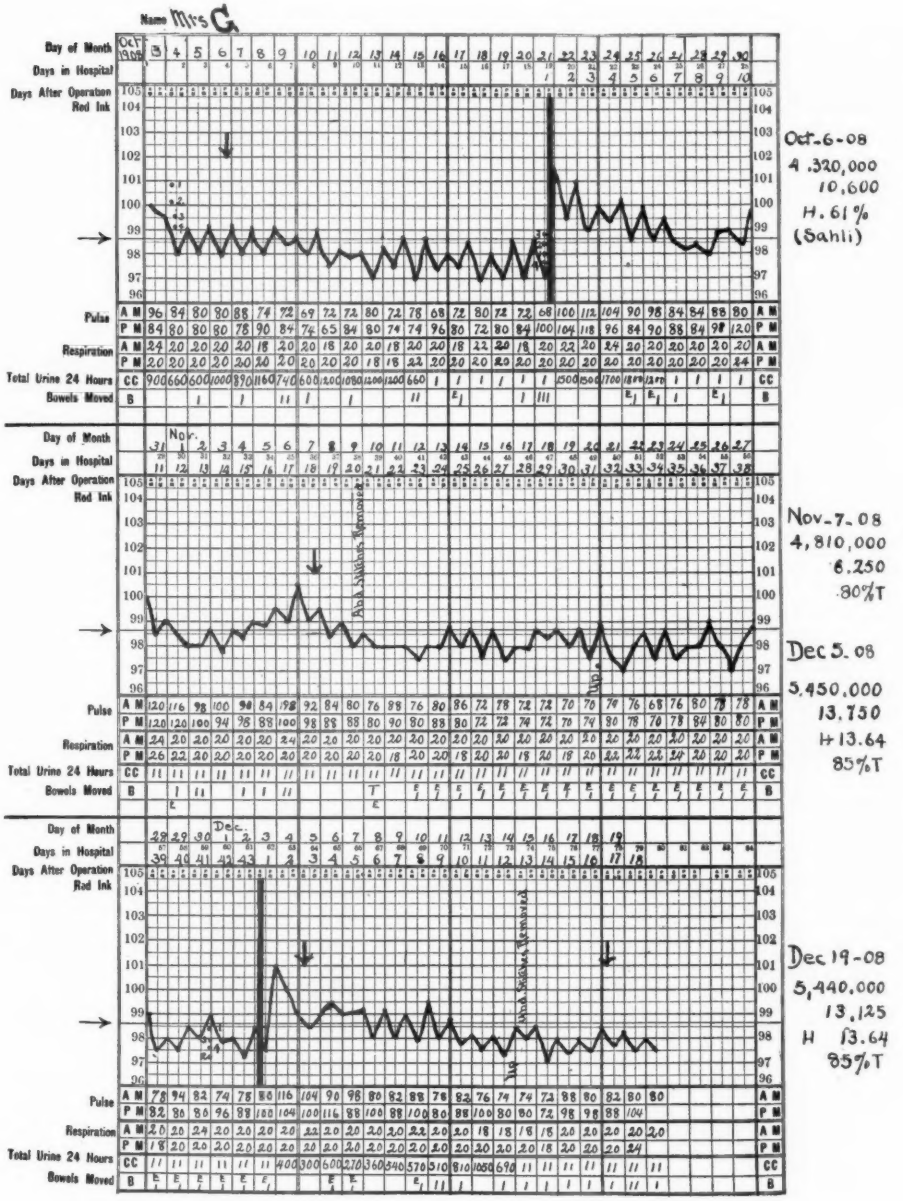


CHART OF MRS. G.

Heavy vertical lines indicate the time of operation. Dots with figures at side represent the hourly temperature after bimanual examination. The arrows indicate the time of blood examinations.

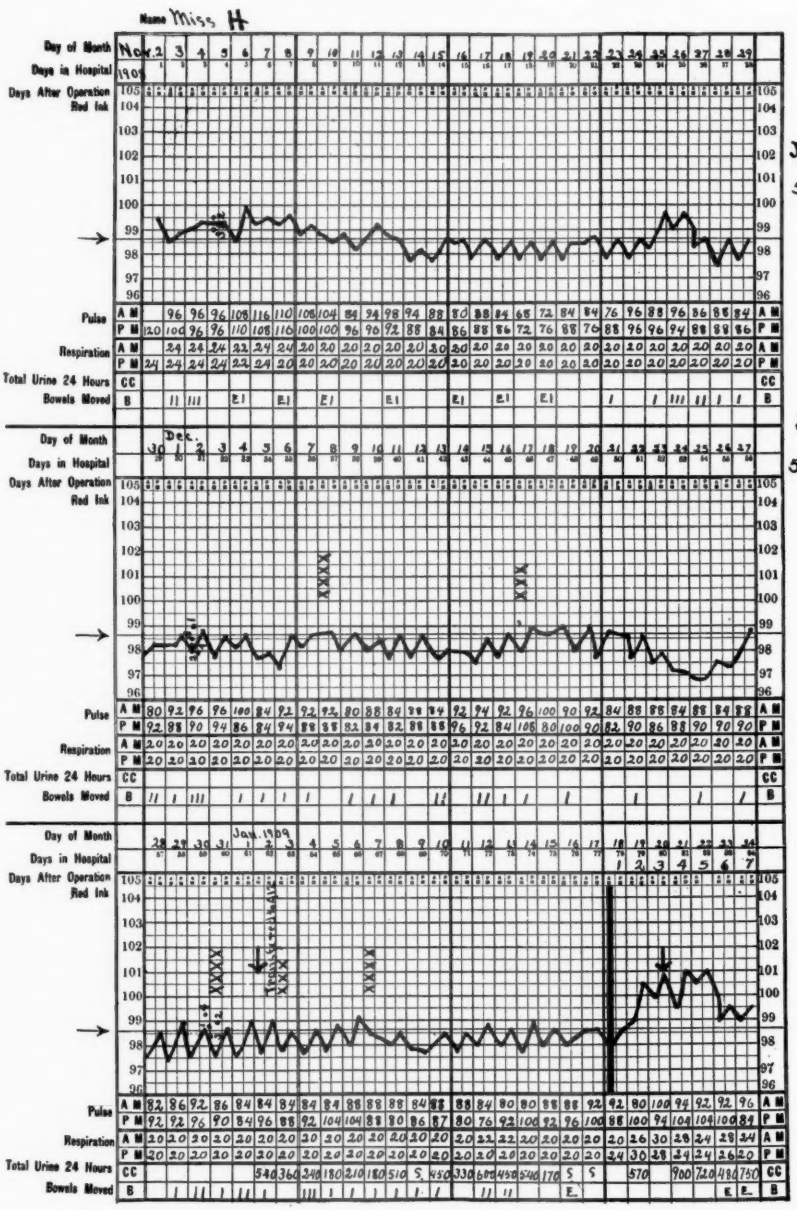
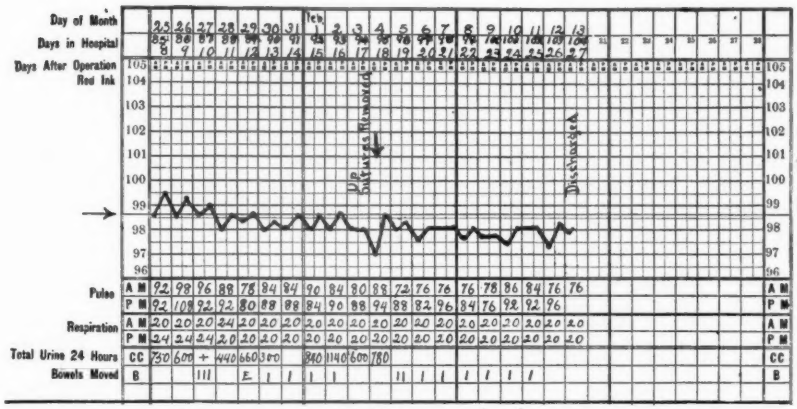
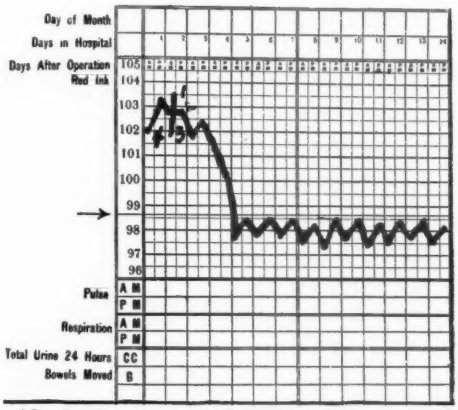


CHART OF MISS H.

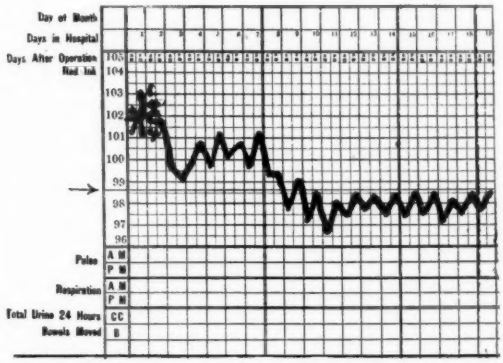
Heavy vertical lines indicate the time of operation. Dots with figures at side represent the hourly temperature after bimanual examination. The arrows indicate the time of blood examinations.



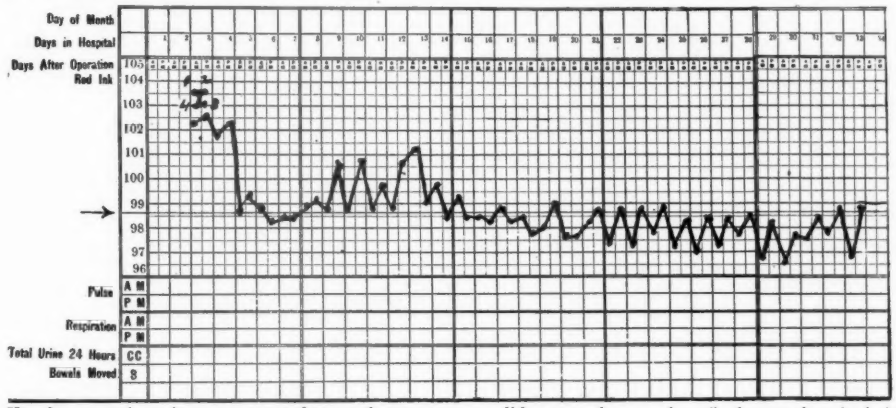
Miss H., *continued.*



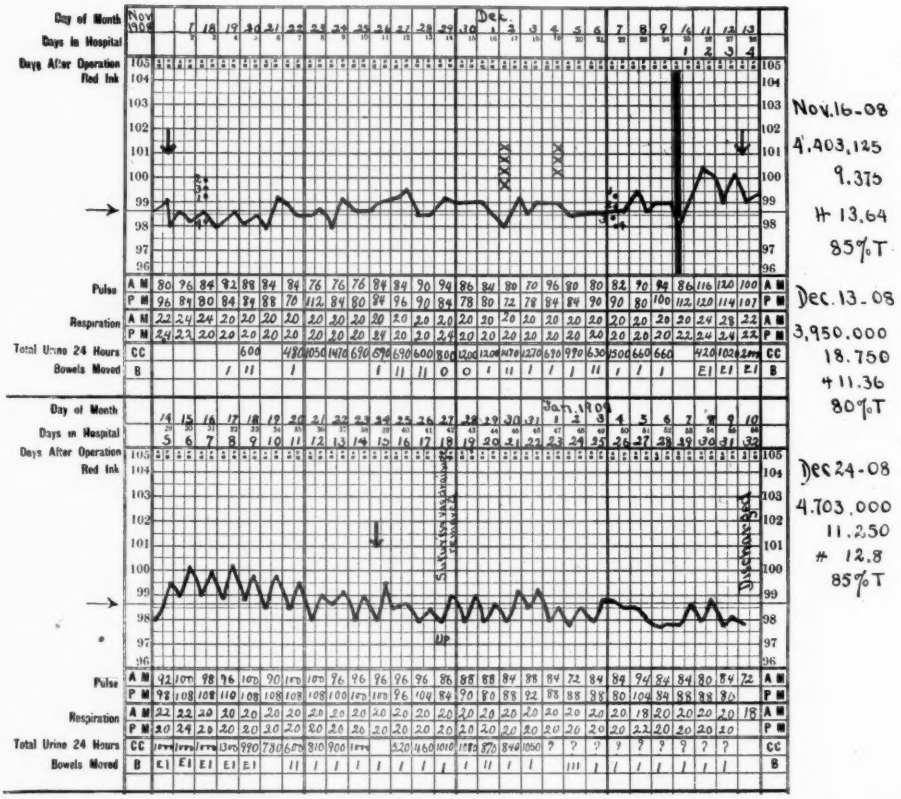
Mrs. I. In 51 per cent of cases the temperature reached normal within 4 days, and remained so thereafter.



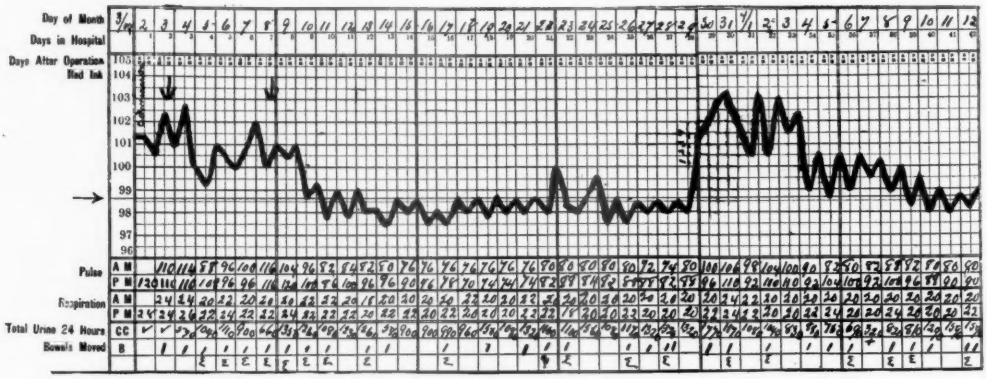
Mrs. J. In 77 per cent of cases the temperature remained normal after 10 days.



Mrs. K. In approximately 22 per cent of cases the temperature did not reach normal until after 10 days had elapsed.



Mrs. L. A dense inflammatory exudate surrounded the pus tubes. Examination was not followed by marked or persistent rise in temperature.



Mrs. M.'s chart demonstrates a persistent rise in temperature following bimanual examination. The infectious focus had not been securely shut out from the lymphatic circulation, and apparently infection was more widely disseminated. Mch. 3-09, RBC, 4.262.000; WBC, 11.650; Hb, .22. Mch. 8-09. RBC, 4.050.000; WBC, 23.000; Hb, .55.

SYMPOSIUM ON DYSTOCIA

THE MANAGEMENT OF LABOR OBSTRUCTED BY PELVIC DISPROPORTION[1]

By RICHARD C. NORRIS, M. D., Philadelphia, Pennsylvania

At the very outset of a discussion of the management of labor obstructed by pelvic disproportion it is necessary to state two propositions that require no argument.

1. All primiparæ and multiparæ with histories of obstructed labors require a certain amount of preliminary study and examination to learn as far as possible the kind and degree of obstacle to labor they are likely to offer.

2. This study shall at once differentiate into a class, all those cases to be grouped under the absolute indication of Cæsarean section.

So much stress has heretofore been laid upon pelvic measurements in the text books and in discussions of this subject that I have felt like making no mention of actual figures in this paper, but this is really impossible in the present state of our knowledge. I do wish, however, to urge upon you my conviction that a study of pelvic diameters alone is a very small part in the problem, except in those cases of extreme deformity that clearly offer no alternative treatment, but require the Cæsarean section. In this class of cases we must admit that no one factor is more important and none can be ascertained with so great a degree of scientific accuracy as the direct measurements of the conjugate diameter of the pelvic inlet. It is generally agreed that a measurement of 7.5 cm. in the generally contracted and 7 cm. in the simple flat pelvis is the limit to the absolute indication. My observation and experience, in view of the remarkable results of the elective section, have brought me to the conviction that this limit should very often be increased to 8 and 7.5 cm. respectively, after a careful estimate of the size of the child and the patient's equipment for a difficult labor. In other words *excessive disproportion* will often be found when the conjugate diameter ranges between 7 and 8 cm., and for these cases Cæsarean section, without the test of labor, will more and more be employed in the future. We can thus dismiss at once all further discussion of the absolute indication, acknowledging that pelvimetry can, for all practical purposes, decide that question in almost all such cases. For the very much larger number of cases that we meet in practice in this country and which we group under the *relative indication* the problem is the most difficult, perhaps, that confronts us in the present day practice of obstetrics. The factors that are offered for study in this group of cases are well known to you. They are (*a*) The relative size of the fœtal head to the pelvis. (*b*) The shape as well as the size of the pelvis, their relation to each other and the altered mechanism of labor that will be produced by each. (*c*) The rigidity or relaxation of the lower birth canal as related to the probable duration and traumatism of labor. (*d*) The probable uterine, nervous and muscular energy of the patient as indicating her equipment for the ordeal of labor.

It would consume too much time and in this presence it is unnecessary to review all the methods that have been advised for the determination of the above-mentioned problems. As we proceed reference will be made only to those which my experience has tested and found the most reliable. After all, the methods of study are to be measured by the results obtained and this question at once presents itself: Can any or all known methods of study before labor, determine with scientific and unerring precision the course of treatment for all cases of the relative indication? The present wide spread interest in this subject, the varying opinions and practice of men of wide experience and their varied results at once negative that question, and th simple truth of the matter is that in individual cases there is more than one fixed plan of treatment that will prove suc-

[1] Read as a part of a Symposium before the Pittsburgh Academy of Medicine, March 9, 1909. See discussion, p. 98.

cessful for both mother and child, and no one plan can be predetermined as the only one to be employed. Until the problems in obstetric resistance and energy are elaborated with the accuracy that characterizes the engineer's work with his physical forces of energy and resistance, we can never hope to have our work so exact as his, and since our problem comprises living tissues modified by past and present diseases, changed and ever changing, with the varying conditions of health, fixed rules can never govern our work. Human judgment based upon experience will always be an important factor with us and to that extent errors will sometimes occur.

PELVIMETRY AND THE STUDY OF RELATIVE DISPROPORTION BETWEEN HEAD AND PELVIS

It is unfortunate that so much stress is placed upon external pelvimetry as a means of determining the *size* of the pelvis. Its value for that purpose is small indeed. It can determine variations in *shape* and should always be looked upon as merely the first stage of the examination to be followed always by an internal examination when there is the slightest evidence of pelvic irregularity from the patient's obstetric history, her stature, her gait, and the general appearance of her bony frame. A primipara near term with the head freely movable above the pelvic inlet always requires such examination. An anæsthetic is always necessary when the promonotory is not readily reached by the index finger. The true conjugate of the pelvis is directly measured with Hirst's pelvimeter, which requires always an intelligent assistant. Then follows a study by palpation, of the prominence of the sacral promontory, the length of the the symphysis pubes, the angle of inclination of the symphysis to the promontory, the straightness or exaggerated curve of the sacrum. The projection and curves of the lateral pelvic walls, the depth of the pelvis, the character of the cervix and pelvic floor are also noted. An attempt is then made to predict to what extent and in what manner all these deviations from the normal will probably modify the mechanism of labor. To what extent the inclination of the pelvis will permit or arrest lateral inclination of the head which is so important in the mechanism of relative disproportion; the probable amount of moulding and adaptation of the cranial bones that will be required to permit partial or complete engagement; in what degree the projection of the lateral pelvic walls, the curve of the sacrum and the depth of the pelvis will interfere with rotation, and the degree of resistance and liability to extensive lacerations of the lower birth canal — all are problems requiring careful study and are of great assistance in estimating the obstacle in any given case.

To estimate the relative size of the head to the pelvis with accuracy it is also necessary to have the patient anæsthetized and her rectum and bladder empty. This examination should be made when the pelvis is measured, and for evident reasons the end of the eighth month is the time selected. Bimanual examination, an assistant firmly pressing the head into the pelvis, has been the most satisfactory method in my experience. Stone's or Perret's method may be employed and the measurements compared with the average biparietal diameters of the fœtal head — 8¼ cm. at the thirty-sixth week of gestation; 9 cm. at the fortieth week. The latter calculations may confirm the results obtained by bimanual examination. The probable size of the head bears some relation to the age of the mother, the size of the father, the history, in multiparæ, of the weight of previous children, and the character of her labors. The general nutrition of the mother bears a slight relation to the moulding and adaptation of the cranial bones. These measurements and estimates of both the head and pelvis, however, are only of relative value and serve us best the nearer the case approaches one or the other extreme of pelvic narrowing within the range of moderate disproportion — in a general way those pelves whose conjugate diameters are nearer to 8 cm. or 10 cm. from the pelvic side of the examination.

Having estimated the probable obstacle to labor we now take into account the muscular, metabolic, and nervous character of patient, as they may count for or against an effective and well endured test of labor. Observation of the patient during pregnancy will enable us to predict that as she has not borne well the strain common to all pregnancies she will likely play out early in her labor and will require early

operative assistance. All this study is necessary to gauge the potential obstruction in any given case, and it is at once apparent that the result for mother and child is dependent, not upon well defined laws but upon an individual's skill, experience in this class of work, and his resultant judgment. Variations in his experience with the several methods of treatment proposed by different authors for moderate obstacle, will do most to convince one that one method is not applicable to all cases. I am here to-night to discuss these questions from the view point of my personal experiences and I cannot do better than crystallize from that experience the general rules that guide me in this class of work.

Having examined as outlined above, a patient with moderate pelvic disproportion — i. e., with a pelvis showing abnormal shape and a conjugate say from 8 to 10 cm. — it is my experience that it is usually impossible to decide before labor that she will not deliver herself without assistance. As a matter of fact more than 80 per cent of such patients do. The nearer the conjugate is to 8 cm. and the larger we estimate the child the greater the number of cases that will require assistance, and this group of cases is the one that calls for our best judgment. Spontaneous labors will occur when the obstacle seems insuperable and this history of nature's own efforts makes it clear to my mind that the test of labor in *moderate disproportion* cannot be abandoned. With the knowledge that major operative treatment that may ultimately be required increases in danger in proportion to the duration of labor and the degree of infection and exhaustion, a test labor must be so managed as to avoid these dangers. This brings me at once to the value of inducing labor after the eighth month of pregnancy and as late as the studied relative disproportion will permit, in order to help those cases that without this aid, would, after test labor at term require either a major operation, such as Cæsarean section or pubiotomy, with their increased maternal mortality in virtue of the test labor, or a very hard, high forceps delivery with its large infant mortality.

A test labor at term with this range of disproportion will require the dangerous major operations in about 5 per cent of the cases. Can the induction of labor in all moderate cases prevent this number of dangerous major operations? My experience teaches me that it can, since in 3,000 consecutive labor cases at the Preston Retreat I have not once performed Cæsarean section, and labor has been induced in every case of moderate disproportion entering the hospital before term. There has been no maternal mortality in these cases, and the infant mortality was 10 per cent. The infant mortality in unobstructed labors has been about 7 per cent. It may be said that by this plan of inducing labor relatively late for all cases of moderate disproportion, 80 per cent of such cases have labor induced unnecessarily. That may be true, but with no maternal mortality, and the admission by the opponents of this plan that it is impossible to say before labor with certainty, which case will ultimately require a major operation under the dangerous conditions that a true test of labor brings at term, it appeals to me and my experience as a practical way to avoid a definite, in fact a large percentage of the more dangerous major operations. The maternal mortality of skillfully induced labor *after the eighth* month of pregnancy in 100 cases certainly is not so great as that of the necessary cases of either Cæsarean section or pubiotomy performed late in labor, at term. The fœtal mortality of the late Cæsarean section certainly would be the smallest, but that of late pubiotomy would not be far below, if it would equal, the ten per cent infant mortality of induced labor.

The best results from induced labor in my experience have been in multiparæ with histories of difficult labors and stillborn infants when the conjugate has been above 8.5 cm. and the pelvis either simple flat or flat rachitic. In these cases, also, operative delivery after induced labor, which ordinarily adds to the infant mortality even in cases brought to labor after the eighth month, has been less dangerous to the infant and may be undertaken at an earlier period in the labor than in primiparæ.

In primiparæ the first stage of an induced labor is more likely to be prolonged and preliminary skillful and slow mechanical dilatation of the cervix and vagina is a distinct advantage. If infection is carefully avoided by a skilled technique, the added danger of this

manipulation to a major operation that may later be required is negligible. It is well known that a study of disproportion between the head and pelvis is far more accurate after labor has begun and the cervix is open and the expulsive energy of the uterus has set in motion the mechanism of labor in a flattened pelvis. Moreover this preliminary dilatation and prompt occurrence of expulsive efforts conserves the patient's strength and reserves her surgical fitness for a subsequent major operation should the latter be required.

I am quite convinced that early elective surgery in obstetrics is just as desirable as in any department of surgery, and when the mechanical obstacle to labor is absolute or even seriously in doubt, the early Cæsarean section is without question the operation of choice. For the border line cases the test of labor cannot be abandoned and our duty is plainly to conduct that test in such a manner as to save the patient's strength, and lessen the mechanical obstacle by wisely inducing labor and above all else protect her from infection and exhaustion, which more than any other factors make for or against the success of a late major operation.

As to the merits of a Cæsarean section and pubiotomy for the border line cases future observation must determine the question. Either operation its equally dangerous as a last resort operation on an exhausted and infected patient. In the hands of an operator equally skilled in both, my conviction is that sound obstetric judgment will sometimes find the one, sometimes the other indicated by conditions of the patient apart from the degree of mechanical obstacle.

My last case, within the month, with a conjugate of 7.5 cm., I delivered successfully by Cæsarean section at the beginning of labor. Next week I shall do a pubiotomy after a test of labor where the conjugate is 8 cm. This patient, a multiparæ was successfully delivered by pubiotomy two years ago.

For the lesser degrees of disproportion — i. e., a conjugate above 9 cm., especially in a pelvis not generally contracted, and with a head of average size, induction of labor two to four weeks before term will usually secure partial engagement, and a skillful high forceps delivery, if necessary, will almost always save the infant. With a conjugate between 8 cm. and 9 cm.,— and from 3 to 4 per cent of child-bearing women in America have conjugates below 9 cm.,— the character of the patient and of the pelvis and the size of the child's head should to a greater degree influence the choice of treatment. The elective treatment I have chosen is to induce labor not earlier than the eighth month, and later if possible; to observe the test of strong expulsive pains for an hour or two after partial instrumental and completed bag dilatation of the cervix and vagina. If the head becomes engaged, high forceps is indicated. In the absence of engagement a careful study of the relative disproportion is made under ether, preparations having been made for an immediate section of the abdomen or pelvis as may be selected. If the head has partially engaged, the anterior parietal bone presenting and the distance between the sagittal suture and the sacral promontory is less than 2 cm., forceps extraction is always abandoned.

When after hard expulsive pains for two hours, the head has not engaged and bimanual examination finds, as is usual, great disproportion, all hope of a successful delivery with high forceps is abandoned. The forceps should never be deliberately chosen for an unengaged head after such a test of labor. Version used to be our alternative but an infant mortality ranging from 20 to 40 per cent almost always makes that treatment obsolete. The choice between section of the abdomen and hebosteotomy is the skirmish line of present day obstetric surgery. If you are convinced that expectancy carried to the degree noted above increases the mortality of the Cæsarean section to 5 or 10 per cent, and that under the same circumstances the section of the pubis may be done with a mortality not half so great, and there are statistics to maintain that position— then you may decide in favor of the latter. On the contrary, if you believe as I do, that the danger of both operations is increased in proportion to the presence and degree of infection and exhaustion and feel sure of the technique employed up to that time, to prevent both, then your own experience with and predilection for the abdominal operation or for pubiotomy will in all probability decide the

choice. Until the final early and late results of pubic section throughout the world under varied conditions have determined the true status of that operation, it is certainly true for America that Cæsarean section for a long time will receive the lion's share of such cases. A comparative statistical study of these two operations under similar conditions of infection and exhaustion and length of labor indicates a slightly lower maternal mortality for hebosteotomy, with a distinctly higher fœtal death rate, because of the trauma to the infant incident to its operative extraction through the birth canal.

The after care of the pubic section may be more troublesome, but the anxiety of mind of the operator depends again upon the experiences of the operator. So far as my knowledge and experience with both operations has gone, my aim is before labor to study carefully my cases from all the view points indicated in this paper, to induce labor whenever it seems reasonably certain to serve its best purpose, to enlarge the scope of elective abdominal section just before or at the very beginning of labor, and when a test labor has been decided upon to induce labor at the latest period of pregnancy permitted by the examnation, and after two hours of active expulsive pains to select more frequently the pubic section for moderate disproportion, believing that after such a test, with a scrupulous technique, hebosteotomy offers the mother a lesser risk and that the maternal risk should always be a dominant factor.

The future developments of pubiotomy and a few disastrous cases may induce me to change my attitude toward that operation and to follow most men in America in their declared choice in favor of Cæsarean section for these border line cases.

My position, then, is a compromise between the lessons taught by nature's efforts to meet and overcome an obstacle and the sometimes too earnest efforts of the modern surgeon to assume the entire burden.

DYSTOCIA DUE TO EXCESSIVE SIZE OF FŒTUS[1]

By WILLIAM S. STONE, M. D., New York City

THE diagnosis of pelvic deformity has reached such a degree of scientific precision that during the past decade surgical intervention has achieved most brilliant therapeutic results. Unfortunately, however, the size of the pelvis is not the only factor to be considered in all cases, except perhaps, in those presenting the very extreme examples of contraction. Such cases, we know, are rare in our native born women, and such as do occur usually find their way for treatment to our large metropolitan hospitals.

But the number of cases in which the degree of contraction is slight is sufficiently large to merit the most careful consideration of every one who assumes the care of a pregnant woman. In these cases, however, the mere knowledge that such a contraction exists is practically worthless unless we can discover the relation that the size of the pelvis has to the size of the fœtal head. On account of our frequent failure to recognize this relation, pelvimetry has justly fallen into quite general disfavor. In addition to these cases in which the pelvis is slightly contracted, there is another class — more common and usually too tardily recognized — in which the pelvic measurements are normal as judged by our accepted standards, but in which the size of the head is so large that we must regard the pelvis as relatively contracted, so far, at least, as the particular pregnancy in question is concerned. It is this class that the writer wishes to consider particularly as his part of this evening's discussion.

The difficulty in definitely ascertaining the relative size of the fœtal head and pelvis before labor has been hitherto regarded by most obstetricians as too great for them to believe that the few observations that have been made relative to this subject will furnish any essential aid in making the diagnosis with sufficient

[1] Read as part of a Symposium before the Pittsburgh Academy of Medicine, March 9, 1909.

accuracy to be of practical value. The writer, however, is one who does not share this pessimistic view, but who believes that the time has arrived when even a moderate amount of observation will enable the general practitioner to, at least, have a suspicion that such a disproportion exists, and that for the specialist enough data can be obtained to enable him to form a judgment which will be uniformly accurate enough to be productive of most successful practical results. One of the reasons for this very general skepticism of our inability to foretell the deleterious influence that abnormal mechanical factors may have upon the course of labor is, that the study of these factors has rather been neglected recently in our enthusiasm to study the metabolic causes of many of the diseases of pregnancy.

All of us, I am sure, will attest to the frequency with which the excessive size of the child has marred an otherwise successful pregnancy and labor. Most of us can probably recall more than one instance in which we have been able to successfully carry a patient through a severe metabolic disturbance in the early months of pregnancy only to be finally obliged to tell an anxious mother after a long and severe labor that the child was too large to be born alive, not to mention the operations which have just been completed to repair the injuries of the maternal tissues. And, even in cases in which the child has been born alive, how many are the instances in which, perhaps, it would have been better if it had not lived. All of you are, without doubt, acquainted with the importance which some of the neurologists (notably Sachs of New York) have recently attached to the deleterious influence which the pressure of a long labor may have upon the subsequent mentality of the child.

It is necessary in order to properly appreciate this part of the subject that we shall review all of the factors that are supposed to relate to or determine an excessive intrauterine growth of the child. And, first, for the purpose of having a definite standard for comparison, many of the writers upon this subject have arbitrarily taken 4,000 grammes as a standard of weight, below which they are regarded as normal, and, including and over which, they are considered as abnormally large. In regard to the frequency with which, as judged by this standard, abnormally large children occur, Jacoby, taking the statistics of five large German clinics, found that in from 2.76 to 8.31 per cent, the children may be regarded as abnormally large. As for sex, boys were two and one-half more frequent than girls among the abnormally large children. Strong and robust constitution of the parents, especially of the mother, was thought to have an influence in many instances, but exceptions were too numerous to regard this as a very important factor.

The statistics of Starck would appear to show that the age of the mother bore some relation, as he found that 65.8 per cent of women who had normal children were under 25 years of age, while of those who gave birth to abnormally large children, 67.6 per cent were over 25 years of age. Jacoby also found that in women over thirty abnormally large children were more frequent, especially if other pregnancies had preceded, and, more especially, if a long period of sterility had intervened since the birth of the last child. He also noted that excessively large children were apt to be born to women in the latter part of the child-bearing period whose menstruation had first appeared rather early in life.

Pinard and others in France consider that the inactivity of the mother during the late months of pregnancy, especially if associated with good care and generous diet, are important elements in favoring an excessive growth of the child.

In regard to the influence of diet, a survey of the literature reveals a surprising lack of information, due, apparently to the few observations that have been made in a number of cases sufficiently large to give any valuable conclusion. The well known diet of Prochownick has been extolled by a few observers, but, in general, it must be admitted that the knowledge relative to the possibility of influencing the size of the fœtus by diet is very fragmentary.

Finally, a factor which merits our special consideration is the relation of the size of the fœtus to the duration of pregnancy. It seems to the writer that such a relationship exists with considerable uniformity and also that prolongation of the pregnancy beyond the time

that is generally regarded as physiological is more frequent than is generally supposed and that many of the cases which we usually ascribe to our errors of calculation are really abnormal prolongations. It is, of course, difficult to definitely determine the duration of pregnancy because there is no accurate method of ascertaining when fecundation occurs, nor are there any signs at the end of the pregnancy that tell definitely how long it has lasted. It is pretty generally agreed that menstruation and ovulation are not synchronous processes, and even in cases in which only one coitus is known to have occurred, there is no certainty of the exact date of fecundation, because, as noted by Issmer, the ovum may remain alive 16 days, and, as observed by Dührssen, spermatozoa have been found alive in the uterus and tubes 25 days after coitus. In the lower animals still wider variations exists in the time between insemination and fertilization. Schlichting places the lowest limit of time for the duration of human pregnancy as 236 days and for the upper limit as 334 days.

According to Issmer, pregnancy is prolonged in multiparæ from three and one-half to five days with each additional pregnancy, according as the time is estimated from coitus or the last menstruation. The age of the patient seems also to be a factor in determining its duration, increasing from four to five days up to the age of 36, after which it gradually shortens. Pinard and Issmer found it to average two days less in those women who take active exercise during the late months of pregnancy. In large and robust women these observers found it to average two days longer.

Winckel's conclusions, that in cases in which the child weighed 4,000 grammes and over, the duration of pregnancy was over 302 days in 14.50 per cent, have been practically confirmed by Füth, Hostteter, Jacoby, and Starck. The average delay in all cases with abnormally large children was 8.22 per cent, if computed from the first day of last menstruation, and six to eight days if computed from coitus. The average delay in 31 cases personally observed by Winckel, in which the average length of the child was 53.8 cm. and the weight 4,276 grammes, was 31 days after menstruation and 22 after coitus. In general, it was found that in 71.8 per cent of cases with abnormally large children the duration of pregnancy was more than 280 days after the first day of the last menstruation, and in 62.7 per cent was more than 270 days after coitus. It was impossible, however, to accurately determine its duration in this way because in the case of two children of the same weight, the periods of gestation may vary as much as ten days. According to Jacoby also, in cases with children weighing over 4,000 grammes the pregnancies were delayed beyond 280 days three times as often as in these cases in which the children were of normal weight, averaging from 287 to 310 days.

Leicester, in observing the relation between the duration of pregnancy and the weight of the child, compared European women living in India, East Indian women and the native India women, found the weight of the child to increase proportionately to the duration of pregnancy in the European women, but was unable to note any uniform difference in either of the other races, possibly because of the small observations.

McKerron says the physiological limit of 280 days is exceeded in from two to three per cent of all cases and observes the following deleterious effects upon the child: (1) The children are longer and larger, although from a decrease in the amount of the fat, the weight may not be excessive. (2) The circumference of the head is greater and the cranial bones are unduly ossified. (3) The shoulders are apt to be excessively developed. (4) The child frequently dies before labor from excessive thrombotic changes in the placenta. He also considers that a prolongation of the pregnancy beyond the time that is ordinarily thought to be physiological has an injurious effect upon the mother: (1) The abdomen may become so over distended that atony of the abdominal wall may result, which may remain permanent, especially in primiparæ. (2) Labor is often long and difficult because of the frequent disproportion that often exists between the fœtal head and the maternal pelvis. (3) Injuries to the soft parts are frequent, often resulting in infection. (4) Post-partum hæmorrhage is also common.

Bossi remarks that fatty degeneration of the

uterine wall may occur to such an extent that uterine inertia may result. Although the present writer cannot at this time offer any statistics which will either disprove or corroborate these conclusions from the literature, his own experience is in general accord with those which have just been presented.

The determination of the relation of the size of the fœtal head to that of the pelvis is naturally beset with many difficulties, but the better appreciation of the fact that such disproportions frequently exist, even when the pelvic measurements are normal, should stimulate us to greater efforts and to the necessity of more frequent examinations during the late months of pregnancy. The necessity for frequent examinations of the urine is now very generally recognized even by the patients, but the importance of repeated examinations of the pelvis for the purpose of discovering any abnormal mechanical factors is not yet sufficiently appreciated even by the profession. It is unreasonable to suppose that the diagnosis can be made with equal facility by the general practitioner and the specialist, but it often seems that the general practitioner is inclined to think that, unless any new detail in obstetrics is such that he can immediately and dexterously carry it out, it does not merit any special consideration. In New York, at least, a consultation to determine the mechanical relations prior to labor is very rare. The methods of diagnosis may be divided into (1) those which may be easily recognized by the general practitioner and (2) those which require some special skill to appreciate. First, of those which everyone should recognize. In multiparæ the previous obstetric history is a matter of the greatest importance, and, in any specific case in which the previous labor or labors have been abnormal in any respect, the cause of the abnormality should be satisfactorily determined, and, unless the attendant is satisfied that similar conditions can be excluded with the present pregnancy, the patient is entitled to another opinion. It should also be remembered that, unfortunately, the absence of an abnormal previous labor does not positively assure us there are no abnormal relations in the present pregnancy. The examination of a multipara gives us less definite information as to the relations between the head and pelvis because of the fact that the head normally is floating above the brim up to the time that labor begins.

In primiparæ we have no history to guide us but the examination gives us one fact of the greatest importance. The head is regularly engaged in the pelvic brim during the last few weeks of preynancy, unless some abnormal relation maintains. This is so constant that the writer would express the opinion that if the head at this time is found floating above the pelvic brim the patient is entitled to another opinion, if the attendant has any doubt as to the proper treatment. There is one source of error even if the head is engaged, say two weeks before the calculated time. It has occurred to the writer in two cases that the head was found to have a satisfactory relation to the pelvis, but labor was postponed two weeks beyond the calculated time, and the second examination, which was not made until the beginning of labor, revealed the fact that since the last examination the head had grown so much that it had risen out of the pelvis and was floating above the brim. The delivery in both instances was accomplished with great difficulty.

2. *Special methods of examination.* Of these the so-called Müller method is best known and one that has been most used. Suprapubic pressure is made upon the head, by which it is attempted to engage it in the pelvic brim. It requires considerable experience to make it a valuable guide, but is a method of great value. A common error that the beginner makes in forming a judgment is to expect that he will be able to make the head descend too far in a case with normal relations. If the fingers of one hand are introduced into the vagina the descent of the head relative to the brim is best appreciated, and, if the fingers in the vagina appreciate even a little descent, it will be usually found that no serious disproportion exists.

The actual measurement of the fœtal head through the abdominal wall prior to labor is a method that is still very little recognized, but in the writer's hands it has been uniformly of great practical value during the past five years. When the writer was in charge of a

large maternity service he was impressed with the facility with which the average fœtal head could be palpated when it was located above the pelvic brim. This led him to attempt the measurement of the occipitofrontal diameter through the abdominal wall with the ordinary pelvimeter.

The successful results which were then obtained in a series of cases were published five years ago, and since that time the writer has practiced this method with such uniform success that he is prompted to speak of it again at this time.

Perret in Paris had already used the same method with an instrument specially designed for the purpose, but it had not been generally adopted, at least in this country, and even at the present time it does not seem to be seriously regarded by most obstetricians. The measurements are made as follows: with the patient in the ordinary dorsal position for an abdominal examination, the examiner stands by the patient's side, facing the lower part of her body. The head is first carefully palpated and its position determined. The occipitofrontal poles are then grasped between the two hands and an assistant places from below the ends of the pelvimeter between the terminal phalanges of the examiner's middle and ring fingers, pushing them firmly inwards as the examiner directs. It is essential that the ends of the pelvimeter are placed between these fingers, because in palpation one naturally places the longest or middle finger nearest the poles from which the measurements are to be taken. If the pelvimeter is placed in front of the middle finger, it will slide forwards and the measurements will be inaccurate. An assistant or nurse is necessary to obtain the best results, in order that the examiner's fingers may be entirely free to locate the fœtal parts. In the series of cases that were then reported the post-partum measurements of the occipitofrontal diameter agreed exactly in 27 cases with those made through the abdominal wall before labor; in 11 there was an error of 0.25 cm., in two there was an error of 0.50 cm. From the measurement of 100 heads of newborn infants it was found that in those with a occipitofrontal diameter of 11 cm. and over, that, if 2.50 cm. were subtracted from the occipitofrontal diameter, it gave very accurately the biparietal diameter, which is the one to be compared with the true conjugate of the pelvis. With the heads which were smaller it was only necessary to subtract 2.00 cm. Small heads with an excessive amount of liquor amnii are the most difficult to measure because of the difficulty of fixing them between the hands while the pressure is made with the pelvimeter. In forming a prognosis from these measurements one naturally wonders how much allowance must be made for moulding of the head during labor. This, of course, varies with the hardness of the head, and in order to have some idea of the compressibility of the head without injury to the cranial bones, compression with the forceps was tried with a few stillborn infants. It was found that under moderate pressure with large heads it was possible to reduce the biparietal diameter 0.50 cm., under hard pressure 0.75 cm. With average sized heads moderate pressure would diminish it 0.75 cm., with hard pressure 1.00 cm. From actual experience with labors in which measurements had been made, it was shown that, if the estimated biparietal and true conjugate were the same, delivery was always successfully accomplished: with a disproportion of 0.25 cm. or 0.50 cm., delivery could be accomplished by the aid of forceps, although with the last amount of disproportion it was difficult.

The Müller method has been used in the majority of cases in connection with the measurements, and the estimation based upon it agreed with that made from the measurements in all except two cases. In these cases reliance was placed upon the measurements which proved to be correct.

During the past five years the writer has made practical use of these measurements in 36 cases in private practice. The measurements after labor have agreed with the antepartum measurements within 0.50 cm. in all cases and the treatment based upon them has been successful in all cases except one, in which a prolapse of the cord occurred during the induction of the labor. In one case, owing to the objection of the family, an induction was not performed and the child was lost after a difficult forceps. In one instance a Cæsarean

section was performed. In this case the biparietal measured 0.50 cm. more than the estimated true conjugate at the seventh month and the mother had lost two previous children. On account of his practically uniform success the writer feels more confidence in the data obtained from these measurements than when he published his series of cases five years ago.

In practically all cases the disproportion can be overcome by an induction of labor performed from seven to fourteen days before the calculated time. The writer is more and more impressed with the marked increase in the hardness of the cranial bones that occurs during the last two weeks of pregnancy. The well merited objection to premature induction of labor when performed from four to eight weeks before the calculated time does not maintain in these cases, because it is not done until the size of the head gives us assurance that we are not dealing with too small a child.

A most important application of these observations is in regard to the cases that go beyond the calculated time. The writer is so impressed with the frequency with which an abnormally large child occurs in cases in which the pregnancy is prolonged, that he never allows it to occur, unless he is assured by the measurements that no disproportion exists. By the use of the measurements, also, the error of performing an induction when the child is too premature can be certainly avoided.

The chief source of error that may occur is due to our inability to foretell the strength of the uterine contraction during labor, but the writer does not consider an induction performed by an expert as involving any more risk to the mother than a normal labor, so that in any doubtful case he always favors the induction. The old argument that she may or that she might have delivered herself normally does not appeal to the writer now as it formerly did. The same man who never hesitates to open the abdomen for a retroverted uterus, to which the patient's symptoms may or may not be due, will assume the so-called conservative attitude when the life of an unborn infant is involved.

The writer's conclusions are: (1) That disproportions between the fœtal head and the maternal pelvis, due to the abnormal size of the head, are a frequent cause of death of the child and of injury to the mother. (2) That such disproportions should be at least surmised by the general practitioner. (3) That they should be definitely recognized by the obstetric specialist in all cases. (4) That they may be successfully treated in most instances by induction of labor performed one or two weeks before the estimated time of labor. (5) That such a disproportion is associated with a prolongation of pregnancy beyond the ordinary duration frequently enough to warrant us in never allowing a case to go "overtime" unless there is positive evidence from a careful examination that no disproportion exists.

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OPERATIVE PROCEDURES FOR THE RELIEF OF DYSTOCIA[1]

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IN cases of dystocia there is ever conflict between the mother and the child to be born. It is a well established truth that we find the great majority of births easy and devoid of difficulty and help is not needed; but we frequently find labor complications which render a physiological termination of the act of birth difficult or impossible, and in our consideration of the technique we will attempt to divide the subject into several broad classifications and the treatment ordinarily recommended for the handling of these cases, with the general principles which underlie each.

There can be no absolute line which will distinguish between the treatment advisable in the different classes, and it is only by a careful consideration of each individual case that we can so outline our method of treatment as to render the best results to our patient and her prospective offspring.

In order to simplify as far as possible we will accept the classifications of Baisch of Doderlein's clinic, who has strongly urged the classification of pelvic contractions into three different classes, which he has respectively named the first, second, and third degree.

His first degree includes cases where the true conjugate is below the average down to a true conjugate of 8 cm.

His second degree includes those cases where the true conjugate is under 8 cm. and not less than 7 cm.

His third degree are those cases where the true conjugate is less than 7 cm.

He entirely disregards the different classifications ordinarily given in text-books, and quite justly so, for even though we were to consider in detail all the present classifications of pelvic contractions it is probable that before we had time to thoroughly digest these classifications a new one would be brought forth or at least several additions made, as it is a well recognized fact that different diseases and deformities do produce their corresponding pelvic contractions.

In a general way the treatment of these cases is divided into five different methods, as:

First, limiting the food of the mother during the last two or three months of pregnancy.

Second, the induction of premature labor before the fœtal head has grown to such a degree and of such consistency that it cannot readily be delivered through the existing pelvis.

Third, pubiotomy or some modification of it such as hæbotomy or symphysiotomy, with the idea of separating the pelvic bones sufficiently to cause an increase of the pelvic diameters.

Fourth, Cæsarean section, or the delivery of the child from an abdominal incision, to avoid the necessity of it having to pass through a birth canal obstructed from any cause, either osseous or the presence of other pathological conditions.

Fifth, embryotomy or crushing operations with the view of decreasing the size of the fœtal parts which of necessity must pass through the obstructed or narrowed birth canal.

The very rapid growth of the fœtus during the last two months of intrauterine life is a well established fact, and for this reason it is not only possible, but very probable, that a diet given with the view of decreasing this rapid growth, as well as delaying ossification of the fœtal bones, would have a reasonable influence along this line.

The diet recommended, however, consists largely of nitrogenous foods, and these nitrogenous foods increase the liability of toxæmia or eclampsia, so that in toxic cases or those where we would have reason to suspect the possibility of eclampsia, this method is absolutely contraindicated, and under other circumstances its field would certainly be limited to what we have termed pelvic contractions of the first degree, or where the true conjugate was 8 cm. or more.

In viewing the history of obstetrics for the past twenty years, it is remarkable that scarcely a single theme of importance remains un-

[1] Read as a part of a Symposium, before the Pittsburgh Academy of Medicine, March 9, 1909.

changed and undisturbed, that nature's shortcomings have been discovered and the proper surgical remedy applied to meet these conditions.

In the general practice of obstetrics as it exists to-day the most popular therapy of narrow pelvis is the induction of labor after the fœtus is viable, but still small enough to pass the narrowed or obstructed birth canal, the application of axis traction forceps or version and extraction of the child. These operations, as well as Cæsarean section and symphysiotomy, have come to us from the preantiseptic period.

In the preantiseptic period Cæsarean section and symphysiotomy were equivalent to a verdict of death for the mother. Either operation was, therefore, rarely performed, and many, if not most, of the great obstetricians of the past up to the last quarter of the nineteenth century, never performed these operations.

The efforts which have been put forth have all been more or less in the interests of the child, and we especially aim to eliminate the necessity of that operation which all obstetricians wish to avoid, namely, craniotomy upon the living child.

The best surgical methods of handling cases of pregnancy with various degrees of contracted pelves *is and must always remain* a matter to be decided by the judgment and experience of the individual obstetrician in charge, and the general laws applied to each individual case.

Each case having so many problems to solve, there can be no strict lines of demarcation drawn between those which should be treated in one way and those which would be better treated in another.

Each method contains certain principles which have been deduced not only by the individual experience of the obstetrician, but by the accumulated and recorded experiences of others which point out the ends to be attained results to be expected, and dangers and complications to be avoided by the different methods of procedure.

In the treatment of these cases of moderately contracted pelves the accumulated evidence in favor of one procedure or against another is still so limited, reveals such diametrically opposite results and variance of opinion, that final judgment must be postponed until the accumulated experience has clearly defined the advantages of one method and the difficulties of the other.

The main questions involved in these cases depend upon the following points:

First. Immediate maternal mortality.

Second. Has the method of delivery selected been such that the future health and well being of the mother is not in jeopardy?

Third. Immediate infantile mortality.

Fourth. Given a living infant, have the circumstances connected with its birth been such that it will be able to successfully combat the dangers of the first year?

It is upon these several points and their relative importance that the entire controversy with regard to the induction of premature labor, severe operations at term, such as pubiotomy, symphysiotomy, and Cæsarean section, is being waged.

In the statistics which I have tabulated regarding the induction of premature labor, in all having collected some 1,500 cases, I find that the maternal mortality is one and four-tenths per cent, while in pubiotomy the collected cases have given a maternal mortality of two and eight-tenths per cent; in Cæsarean section in the last five years the statistics which I have been able to review would indicate a maternal mortality of about six and three-tenths per cent.

This would seem to prove rather clearly and conclusively that as far as the well being of the mother is concerned the induction of premature labor would offer the best results, but for it to offer results we must necessarily have had our patient under observation from relatively early in pregnancy, so that the question involved with regard to the induction of labor offers itself somewhat as follows:

Given a patient with a moderately contracted pelvis or a true conjugate of 8 cm. or over, who presents herself for examination sufficiently early, and who is tractable enough to follow the advice of the obstetrician, should he advise induction of premature labor, or should he take the chance of delivery at term, and if the induction of premature labor be decided upon, at what time can this be most advantageously done?

The statistics as quoted in this paper seem to indicate that as regards the safety and wel-

fare of the mother the evidence is largely in favor of the induction of labor. In the first place we are assured of the easier labor whether terminated by natural forces or artificial. Other things being equal, the delivery must be just so much less severe as the child's head is smaller and more readily moulded by reason of its prematurity.

The risk of infection from the introduction of the catheter or hydrostatic bags is slight and is wholly dependent upon the care and technique of the latter. Certainly the chances of infection from the many procedures necessary for the induction of labor are no greater than those involved in difficult forceps deliveries, version, etc., at term.

In addition to the actual question of the introduction of bacteria in the genital tract we should bear in mind that the patient, who is for a long time subjected to the exhausting effects of severe labor pains, has greatly diminished vital resistance, and this is no small factor in determining infection, and many times is probably the decisive one.

Our guest, Dr. Stone, has rendered very valuable assistance to us in perfecting the technique of measuring the child's head while still contained in the uterine cavity.

Another interesting fact which he has brought out is that the biparietal diameter, or the diameter which must come through the true conjugate, increases as much as 2 cm. during the last six weeks of pregnancy, and that if these cases are allowed to go to term we not only have to deal with the increased size of the child's head, but also with the increased hardening of the bones and an increased difficulty of securing the same amount of moulding.

The possible danger of injuries to or the separation of the placenta, or the premature rupture of the membranes, may be reduced to a very small percentage by the exercise of the proper skill and care on the part of the obstetrician and by the choice of a method which is suitable to each individual case.

The shock produced by the premature induction of labor is not greater than the shock of the normal labor in normal cases, but this shock may be quite a serious matter in various operative procedures required to deliver a large head through a small pelvis.

If we allow these cases to go to term we have at the best a severe protracted labor, leaving the woman exhausted with diminished vital powers, and in the more severe cases we risk ultimately having a high forceps operation or version, in which the danger from infection, injury, and shock far exceeds those involved in a well executed premature labor.

In the worst cases where we even find delivery impossible, we have the added danger and shock incident to pubiotomy and Cæsarean section, while in many instances these more major procedures have had to be done at a time when the woman had been in labor for a number of hours, when infection was at least theoretically present, and where the continued pressure and exhausted condition of the maternal organism had very materially decreased their vital resistance.

For induction of premature labor it may be accepted that in the properly chosen case the maternal risk is less than by any other procedure, and this is borne out by the statistics previously given which illustrate the results obtained by many different obstetricians under varying circumstances.

As for the infantile mortality, the case is not so clear and the arguments most frequently advanced against induced labor may be summed up in two parts:

First. It is argued that granted a living premature child, its chances of surviving the first year are less than if born at term.

Second. That prevailing public sentiment would censure us if after procedures obviously designed to save the child, we still have one born dead.

The unfortunate features of this later state of affairs may be largely avoided by the proper presentation of the matter to the parents and by avoiding, in our zeal to get permission to do what we consider the safest and most scientific procedure, a too bright outlook for the infant.

There still remains only the plea that premature children present an extremely high mortality during the first year of their life. This mortality has been very materially reduced by our more clear understanding of the needs and requirements of premature infants and by our improved method of handling them.

To be just with ourselves and with our

patients in estimating the fœtal mortality, we should compare the mortality rate after a fairly easy induced labor with that after severe and especially operative deliveries at term; in as much as it is to avoid these other operative procedures that we start labor early, we must remember the ill effects of prolonged excessive pressure of the child's head, the large amount of moulding required for delivery of a full sized head through a pelvis even moderately contracted, and the frequency of infantile mortality from high forceps and version.

PUBIOTOMY

There is a marked variance between the opinions expressed on this subject at the last German Gynecological Congress at Dresden, 1907, and the last meeting of the American Gynecological Society at Philadelphia, 1908. In Germany all the leaders with the exception of Leopold were enthusiastically in favor of subcutaneous varieties of disjunction of the pelvis in the treatment of moderately contracted and narrow pelvis. Leopold, opposing hebosteotomy, sought to prove that the same good results can be obtained with the compromise operations; but Baisch showed that Leopold made a mistake in his comparisons and that he erred in the calculation of his statistics. Hofmeier favored Cæsarean section; Kuestner, artificial premature labor; E. Bauer warns against too great an application of Cæsarean section as well as hebosteotomy. A. Breau (Paris) thinks that hebosteotomy is as disagreeable in its consequences as symphysiotomy. At far as the speaker is able to determine, those who oppose hebosteotomy have had no personal experience with the operation. In Italy and France both symphysiotomy and pubiotomy are generally accepted. In these two countries and in Germany the so-called compromise operations — the induction of premature labor, prophylactic version, the high forceps and perforation of the living child — are being gradually eliminated from the therapy of narrow pelvis. But in England, in the United States of America, and in Canada, the division of the bony ring of the pelvis, whether in the pubic joint or to one side of it, has found little favor and few followers. With the exception of a few members, the American Gynecological Society, which discussed this subject, condemned symphysiotomy and pubiotomy in unmeasured terms, notwithstanding that Williams of Baltimore, performed Doederlein's hebosteotomy thirteen times and was well pleased with the result; that Norris, of Philadelphia, and Fry of Washington, believe there is a place for both operations.

The first successful pubiotomy in America was done by Dr. E. S. Montgomery of Quincy, Illinois, in 1903, for an impacted mento-posterior position, but the principle of enlarging the pelvis by cutting through some portion of the bony ring is an old one, and for a time after the introduction of symphysiotomy this operation was thought to serve a purpose. But because of the bad results for the mother from its use, due to the injuries of the bladder and urethra or the faulty union of the bones, so as to produce a waddling gait, or to other causes, it fell decidedly into disfavor.

Gigli of Florence, however, recognizing the advantage that separation of the bony ring had on increasing the pelvic diameter, in 1893 devised the operation known as pubiotomy or cutting through the pubes with a saw at a point one-half inch or more from the symphysis. He had, however, no opportunity to try his operation for some ten years, and his first case occurred in 1902.

Meanwhile Bonard in 1897 found himself in a mountain hut unable to deliver the infant without resorting to craniotomy. Remembering the operation described by Gigli, he tried it, and was successful in securing a living child and without any maternal complications.

The second operation was done by Caldereni of Bologne in 1899.

Van der Villi of Haarlan has the honor of having done the third case in 1901, while Gigli himself had his first opportunity to try his operation in 1902, or almost ten years after having first described it. His operation at that time consisted of the open method, and Gigli himself described the incision by stating that it extends from the superior border of the pubes, one cm. to either side of the median line downward and outward opposite the labia majora to the lower edge of the pubic bone, but that the incision should be about the region of the subpubic tubercle.

He stated that no large vessels were encountered and that it was not necessary to dissect the tissue from the bone. The ligature was carried behind the os pubes from above down by means of a blunt needle probe; the course behind the bone being controlled by the finger in the vagina. A large silk ligature was drawn through the incision, and the saw attached to the ligature and then drawn in place.

With a slight modification, Gigli's description is still the classical operation when it is done by the open method.

Doederlein, however, advised a subcutaneous method of doing this with the idea of limiting the extent of the open wound, which had frequently become infected from being constantly in lochial discharges.

In his operation he punctures the skin above and below the pubes, and with an especially designed needle he passes the saw around the bone from below up, after which the bone is separated. In case the head was pressing the bladder firmly against the pubic bone his upper incision was slightly enlarged, and with his finger he dissected away the bladder attachment.

Doderlein's modification of the original operation is the one which is usually used when this procedure is done at the present time.

The enthusiasm of the men who early did this operation led many to believe that in it we had found a panacea for all cases of pelvic contraction, that it would displace prophylactic version and high forceps, making the induction of premature labor as well as Cæsarean section unnecessary, and place craniotomy on the living in the realms of the past.

The field where pubiotomy is indicated has never been defined, and there seems to be quite a variance of opinion regarding the degree of contraction, but in general it seems that while one or two operators claim to have been successful in cases where the true conjugate was as low as 6 cm., still we find the consensus of opinion to be that the operation is as a general rule not advisable when the true conjugate is much below 7 cm. unless there is a corresponding decrease in the size of the fœtal head.

The reported statistics in this operation would indicate a very low mortality, as Montgomery collected a series of 133 cases which were regarded as aseptic, at the time of the operation, where there was no maternal mortality.

Gigli collected 100 Italian cases without mortality.

Fry collected 20 cases, 12 of which he has classified as primary or aseptic cases, or in other words, those cases where the operation was done as soon as it was found that a normal delivery was impossible. In these cases there was no maternal mortality.

The remaining eight cases were classed as secondary cases in which there had been one or more applications of forceps and other intrauterine manipulations with a view of delivering. Of these eight cases there was a mortality of 50 per cent; two of them having died of shock on the second day; four of them having died of sepsis on the eleventh day, and one of septic phlebitis and pulmonary embolism.

This high mortality in Fry's eight secondary cases can, with the exception of those who died of shock and embolism, be charged against the primary operation which was done prior to the pubiotomy and cannot justly be charged to the operation itself.

Pubiotomy having as its sole excuse for replacing symphysiotomy, the lessened danger of injury to the soft parts, it may be well to review briefly the relative claims of each.

Pubiotomy separates bone at a point where union can be expected with the same certainty as in any other bone where the circulation was good in both fragments and accurate approximation can be secured. Being slightly to the side of the vagina, urethra, and clitoris, with reasonable care injuries to these parts are infrequent.

Many experiments have been done with an idea of determining the amount of increase in the pelvic diameters after a certain degree of separation of the pubes. It seems that there is no constant proportion between the amount of separation and the relative increase, but in a general way it can be stated that in a reasonably young individual the bones can be separated as much as 7 cm. without the separation itself causing injury to the soft parts of the maternal organisms, provided that it is done slowly by the stretching process and not roughly torn apart.

The amount of increase in the pelvic diameter seems to be fairly constant with the different observers and before we determine upon pubiotomy as the proper method for delivering in a given case, we must have a reasonably accurate idea as to the size of the fœtal head, and the correct measurement of the true conjugate, taking into consideration the age of the patient and the amount of pelvic enlargement we can expect from the degree of pubic separation which would be possible in the individual case.

No definite limit can be set either as to the size of the fœtal head or as to the size of the pelvis as indicated by the diameter of the true conjugate, but in either instance, it is the relative size of the head and pelvis upon which our decision must be based, and as long as there exists such a difference of opinion regarding the lowest possible diameter in which this operation can with reasonable certainty be successful, I think it is well for us as individuals to limit our cases to those in which we are absolutely sure it can be successfully performed.

Another field of usefulness has also been suggested, and this has been in cases where there is some question in our mind regarding the relative size of the fœtal head and the pelvis, and under these circumstances it has been recommended that a subpubic incision be made, the saw inserted, and if we find delivery to be impossible by the natural forces we can very readily separate the pubic bones, thereby increasing the pelvic diameter from one to two cm.

Before we undertake an operation of this character it is necessary for us to understand the accidents which may occur, in order to diagnose and treat them with a full understanding of the existing pathology.

They seem to occur from three different causes, some of which are no doubt avoidable if the operation is done successfully by a man who is accustomed to the technique of the same. The others are accidents which may occur in any individual case regardless of the operator's skill or the relative size of the head and pelvis.

Kromoner has divided these injuries into three classes:

His first class is those made by the carrier of the saw, which occur about the summit of the bladder, and he states that this injury occurs more frequently when the needle and saw are introduced from above downward.

He was always able to discover an accident of this character immediately, owing to the oozing out of the small quantity of urine which is contained in the bladder. For this accident it was necessary to enlarge the incision above the pubes and repair. In every instance he was able to secure a good result, and had no mortality from this class of accident.

In his own cases he had no accidents from the rapid separation of the bones, but when they do occur they occur in the lower portion of the bladder near the opening of the urethra, which occasionally is torn, leaving some incontinence of urine due to an injury of the sphincter muscle.

An accident of this character usually occurs when no provisions have been made to prevent the rapid separation, and in one or two instances, in addition to the separation of the pubic bones they had placed the patient in the Walcher position. This Walcher position is entirely unnecessary in cases of pubiotomy, and he also believes that adhesive plaster should be placed around the pelvis before being divided in the center, and provision made for tying there by means of gauze bandages to prevent too rapid separation or a separation which exceeds the amount necessary to secure relative enlargement or an amount which is well within the margin of safety.

Pressure lesions in pubiotomy occasionally come on the same as they do in other difficult and tedious labors where the head presses against the urethra for a considerable length of time. They manifest themselves during the puerperium and are marked by the exfoliation of necrotic portion of urethra or bladder wall.

The latter cases were treated by the use of a permanent catheter left in during the first week of the puerperal period.

CÆSAREAN SECTION

It is unnecessary to state that Cæsarean section is applicable in all cases of pelvic contraction, but the statistics show that it carries with it a higher maternal mortality than either the

induction of premature labor or pubiotomy, and it is my opinion that this maternal mortality has now been reduced to about as low a point as we can expect until some radical improvement has been made in the technique of the operation.

It undoubtedly has the advantage of giving the lowest possible fœtal mortality. In this operation as in pubiotomy, it is always well to determine the necessity of it before labor actually begins, as the mortality and morbidity after unsuccessful efforts at delivery is more than four times the mortality given in my statistics here to-night, and it cannot be too strongly impressed upon us that our duty to our patients demands that sufficient investigation is made in every case prior to the time labor begins in order that we can without hesitancy select the proper method of artificial delivery and proceed to do the same as soon as a reasonable test of the maternal forces has failed.

CRANIOTOMY

Craniotomy is certainly very rarely justifiable in the living infant, but in this, as all other operations we have considered to-night, there may be some existing pathological condition of the pelvis other than bony contractions which would determine our method of delivery.

To summarize I would state:

First. In a perfectly healthy individual where we have no evidence of toxæmia, it is certainly quite justifiable to make an attempt to prevent the overgrowth of the child.

Second. In properly selected cases induced labor is less dangerous for the mother, carrying with it a lower mortality than either pubiotomy or Cæsarean section.

Third. The induction of premature labor is probably the choice of procedures in cases where the delivery can readily be accomplished at the thirty-sixth week or beyond, and in some instances might be indicated a week or more prior to this time.

Fourth. The proper time for interference should be determined by the Stone method of measuring the fœtal head while still in the uterus, by careful pelvic measurements, and by repeated bimanual examinations by Müeller's method.

Fifth. It is extremely important to provide skilled care for the premature infant for at least two months after delivery, and the most essential part of this skilled care is that the child be breast fed, either by the mother or a wet nurse.

Sixth. Pubiotomy has a field which is relatively small, still where it is possible it gives a lower maternal mortality than Cæsarean section.

Seventh. Pubiotomy carries with it relatively little danger of infection, as the wounds do not, or at least should not, communicate in any way with the pelvic canal or the peritoneal cavity.

Eighth. Accidents in pubiotomy are relatively harmless as injuries to the bladder can be successfully repaired and a hæmorrhage causing hæmatoma of the labia is seldom a matter of importance and usually clears up in a short time.

Ninth. Lacerations in the vaginal wall have occurred in a few cases. They should be examined for and if they exist an immediate repair is indicated.

Tenth. The majority of injuries to the bladder wall have been due to too rapid separation of the bones and too rapid delivery. For that reason the separation of the bones should be under control of the operator as indicated in the body of this paper, and after bony separation, labor should be allowed to go on in its natural way unless some absolute indication exists for instrumental delivery.

Eleventh. In cases where a theoretical infection already exists it gives a decidedly lower mortality than Cæsarean section.

Twelfth. Cæsarean section should be the operation of choice where the other procedures are not indicated or where the relative size of the pelvis and the fœtal head is such that we cannot hope to secure a living infant from premature delivery or pubiotomy.

Thirteenth. The method of delivery in any individual case should be determined before labor actually starts, as the maternal mortality comes largely from operations having been done when delivery by the natural forces supplemented by forceps operations have failed.

Fourteenth. I cannot conceive of any condition where craniotomy upon the living child is justifiable.

DEPARTMENT OF TECHNIQUE

A RADICAL OPERATION FOR CARCINOMA OF THE LOWER LIP

With a New Stitch for Closing Edge of the Lip

By ARTHUR E. HERTZLER, M. D., Kansas City, Missouri

Cancers of the lip, of all the cancers, should offer the most favorable object for a cure. The exposed position of the lip causes the lesion to be forced upon the attention of the victim at the very earliest stage of the disease, and the pain caused by it usually leads him early to seek advice. The exposed position makes it particularly easy of examination, and a positive clinical diagnosis is possible at the very earliest stages of the growth.

Notwithstanding these favorable factors the results from operations have not been as good as they should be. The cause of this shortcoming is, I believe, to be found in the incomplete operations advised for this disease. The rule is universal in

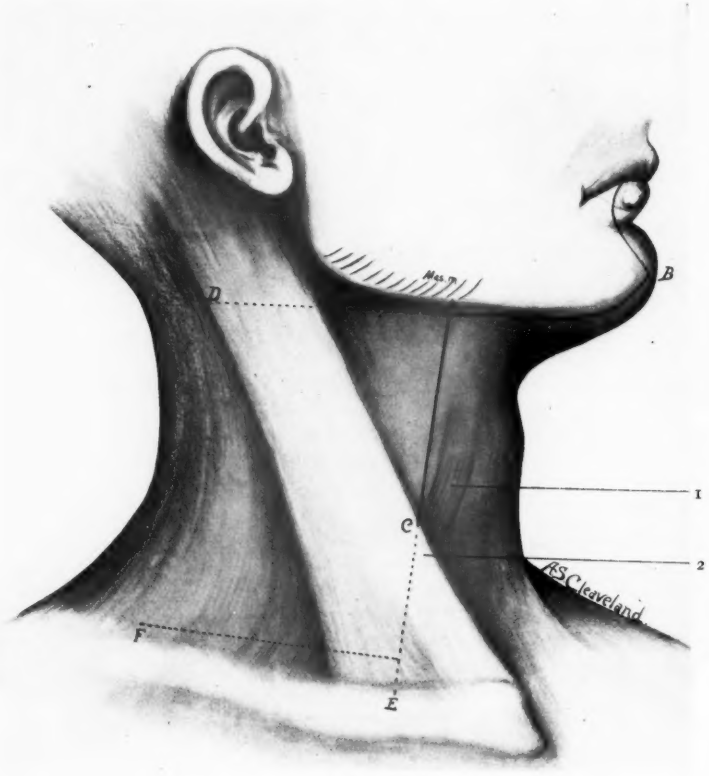

Fig. 1.
1. Omo-hyoid muscle. 2. Sterno-mastoid muscle.

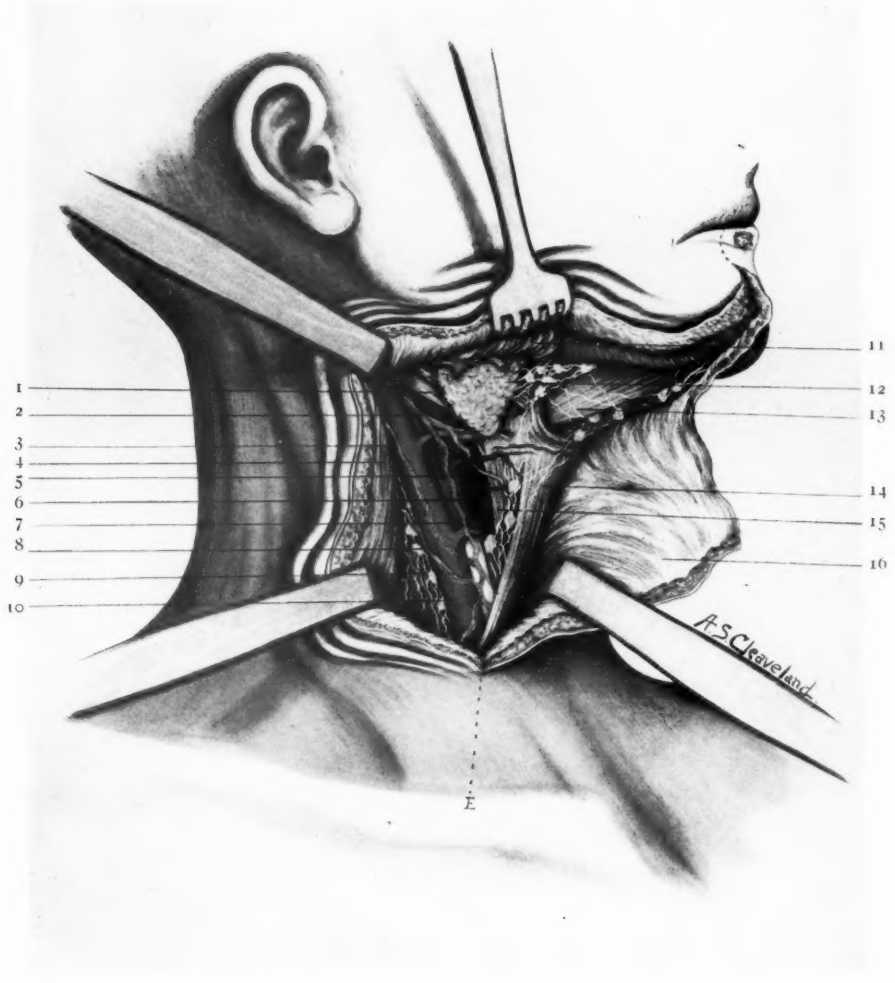

Fig. 2.

1. Post. belly digastric.
2. Hypoglossal nerve.
3. Communicantes hypoglossi nerve.
4. Sterno-mastoid.
5. Des. hypoglossi nerve.
6. Sup. thyroid artery.
7. Com. carotid artery.
8. Com. hypoglossi nerve.
9. Phrenic nerve.
10. Int. jugular vein.
11. Masseter.
12. Submaxillary gland.
13. Digastric.
14. Ant. belly omo-hyoid.
15. Thyro-hyoid.
16. Platysma-myoides.

Fig. 3.

operations of the breast to clean out the axilla, whether the glands are palpable or not. I desire to advocate the removal of the glands and the gland-bearing tissue adjacent to the lip, in all cases, including the very early ones.

The lip is drained by lymphatics which descend over the chin on either side of the median line to the submental glands. These glands are located in the triangle formed by the anterior bellies of the digastric muscles and the hyoid bone. They are usually from 2 to 6 in number. From these the lymphatic vessels pass (*a*) downwards across the hyoid bone and terminate in a gland on the anterior surface of the internal jugular vein at a point where this vessel is crossed by the omo-hyoid muscle, and (*b*) a number of channels lead outward and downward to the submaxillary glands. At the external end of the lip, channels lead to the inframaxillary gland, which is situated over the inferior border of the inferior maxillary bone just anterior to the point of crossing of the facial vein. From this gland channels lead to the submaxillary glands. The submaxillary glands in turn drain into the deep cervical glands. The mucous membrane of the lip is drained by lymphatics which pass direct to the submaxillary glands.

The gland-bearing area would be the submental and the inframaxillary in the first link, and the subhyoid and the submaxillary in the second link, and finally, the deep cervical in the third. I believe the first and second links should be removed in all instances. If these are not obviously involved, their removal together with the gland-bearing tissue in this region is all that is required. Should they be obviously cancerous, then the third link, the deep cervical glands, on the corresponding side, or both sides as the case may be, should also be removed.

The removal of this amount of tissue can best be made by an incision passing over either side of the point of the chin, curving over to the inferior border of the inferior maxillary bone, extending back to the anterior border of the masseter muscle, hence downward to the point of crossing of the omo-hyoid and the sterno-mastoid muscles (Fig. 1). It should be noted that the incisions pass on either side of the point of the chin. The object of this is to leave the skin attached at this point, for if the skin at this point is loosened it is difficult to keep the flaps in position over the point of the chin. When the lesion is extensive this point of attachment cannot, of course, be preserved.

The lymphatics pass on either side of this tissue and there is no reason for its removal. The submental space may be easily cleaned out by pulling the skin to either side. The character of the incision in the lip itself depends on the size of the

Fig. 4.

lesion. If small or medium in size the triangular incision as shown in Figure 4 is the most convenient. If very extensive the incision of Grant is more suitable, to which is added the incision as here illustrated. If it becomes necessary to remove the deep cervical glands, the incision may extend downward to the clavicle and backward to the tip of the mastoid process. A second transverse incision may be added which runs parallel to the clavicle (Fig. 1). The neck incision then resembles that recommended by Plummer for the removal of tubercular glands of the neck. With such an incision the entire chain of cervical glands and the gland-bearing tissue can be removed.

As in the breast, the dissection should be begun at the point farthest from the growth and proceeded with toward the lesion. The dissection should begin, therefore, at the angle between the omohyoid and the sterno-mastoid muscles. The vessels and trachea are laid bare up to the inferior maxilla, laying bare the sterno-hyoid and the sterno-thyroid, the digastric and the myohyoglossus muscles (Fig. 2). It is not necessary to remove these muscles. The removal of the salivary glands facilitates the clearing out of the regions they occupy. Should the submaxillary glands be found to be involved, the incision should be lengthened as indicated on the side on which the glands are involved, the deep cervical glands, and the entire gland-bearing tissue removed. The deep cervical glands may be removed according to the technic recommended by Crile. If needed a second sitting may be employed to clean out one of the sides. It will rarely be needed, however, for a fairly skillful anatomist should complete the entire dissection in two hours, or at most two and a half hours.

When the dissection is completed up to the chin, the tumor itself should be removed. If necrotic it should be thoroughly cauterized before beginning the operation, and protected by a wet formalin pack.

The incision in the neck can be conveniently closed with a running suture of silk or catgut. Drainage should be provided for at the lower angle of the wound (Fig. 3). For the closure of the incision in the border of the lip I have adopted a special plan. The passage of the suture is clearly shown in the cut (Fig. 4), and requires no description. The advantage of this suture is that the vermilion border is held in apposition, while the knots are all placed on the skin surface of the lip, where they cause no irritation. I have found this suture to give very excellent results in the usual plastic operations of the lip, and in the repair of lacerations of the cervix of the uterus.

An operation so planned meets the requirements of a complete operation for cancer namely:

1. The removal of healthy glands and gland-bearing tissue central to the lesion, or central to the most central glands affected.

2. Proceeding from the healthy to the diseased, thus preventing the liberation of malignant cells by the manipulations of the operation.

3. The closure of the wound in such manner as to secure the speediest healing and the best cosmetic results.

HERNIOTOMY WITHOUT BURIED SUTURES

By E. M. PRINCE, M. D.
Gynecologist St. Vincent's Hospital; Surgeon Hillman Hospital, Birmingham, Alabama

The operation herein described was suggested to me by the constant anticipation of suppuration in the wound from buried suture material. We all know this quite frequently occurs where we have buried sutures, and if we can get the same or better coaptation without this it would be quite an advantage in hernia operations.

The cuts presented apply to inguinal hernia, but the overlapping of fascia with the stitch coming out near the original incision can be applied to any class of hernia and will give equally good results.

About 73 per cent of all herniæ are of the inguinal type, 18 per cent femoral, about 8 per cent umbilical and 1 per cent of the unusual kind. Hernia is more often seen in the male than in the female. The femoral type occurs more frequently in the female. In infancy we find the proportion of hernia to population is about 19 to the 1,000 individuals, or about two to every hundred. After the first year there is a marked reduction in the percentage per population until old age is reached, when we find the greater number per thousand, which is about 25.

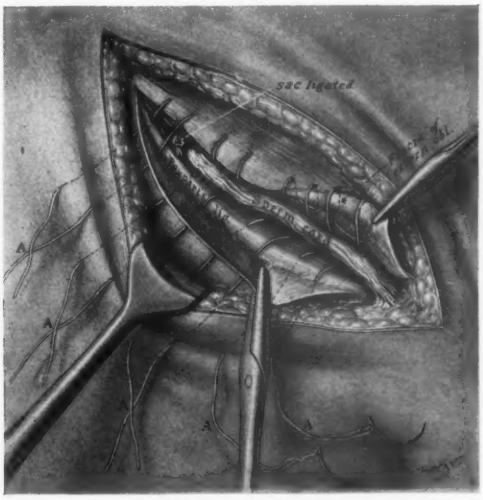

Fig. 1. The above figure represents the deep silkworm gut sutures passing through the transversalis and internal oblique muscles together with the fascia of external oblique. One end of suture being carried below the other above Poupart's ligament to skin surface below the external incision, and are generally to be tied over a roll of gauze or rubber tubing.

Fig. 2. This figure represents the silkworm gut sutures tied over a piece of rubber tubing which brings the two muscles and aponeurosis of external oblique in direct coaptation with Poupart's ligament. A slit is shown above the aponeurosis of external oblique into which the reflected portion of the aponeurosis is to be inserted as shown in Fig. 3.

The large number of individuals afflicted with this deformity would lead one to believe that a careful study of a sure remedy without too great a risk of failure in carrying it out would be time well spent. The "radical cure" of hernia has been spoken of and claimed by many before any radical cures were ever proven; and until Bassini placed before the surgical world his method, with over two hundred cases cured, very little advancement had been made in perfecting this operation.

The older surgeons endeavored to construct a canal as nearly normal as possible, while Bassini endeavored to improve on the work of nature and build a canal stronger than normal. In all of our hernia operations of to-day we do not attempt to "restore the canal to its normal condition," but follow the lead of the Italian surgeon and improve upon the work of nature. We know there is a anatomical defect present in the greater number of the human family in the distribution of struc-

tures that go to make up the inguinal region, and it is by the removal of some tissue found there, with the replacement of other structure not normally found, that all surgeons hope to perfect a cure.

Older operators always endeavored to do their work by dealing only with the external ring, while recent operators begin with the peritoneum and work outward.

The pictures presented will practically describe the operation, but I will briefly refer to the several steps that go to make the operation a success. There is nothing new in the overlapping of structures, but the manner of placing the sutures and the utilization of the fascia as herein described, I do not think has been presented by any one up to the present time.

OPERATION

Make an incision about one and a half inches above Poupart's ligament down to the fascia of the external oblique, freeing the anterior or external surface of this fascia from fat, etc. In making this incision we will cut the superficial epigastric and superficial pubic vessels, but by clamping these we will find no ligature is necessary to control the bleeding. We then locate the external ring, which is done by stripping down the intercolumnar fascia by which this ring is partially covered. We can then make our incision through the external oblique on a grooved director passed into the external ring, or without the use of the director, as one prefers. This incision should be so made that the reflected portion of the external oblique above Poupart's ligament will be sufficient to cover the cord, as shown in drawing 3. We deal with the sac in the usual way. We then dissect up the fascia of the external oblique from the internal oblique muscle until its edge can be easily brought down to the edge of the internal oblique and transversalis muscles. Both ends of a suture of strong silkworm gut are threaded on a needle. Each needle is passed through the transversalis and internal oblique muscles, both emerging through fascia of the external oblique. Both needles are now passed under the cord. One needle is passed below, the other above, Poupart's ligament to skin surface, as shown in Fig. 1. These sutures are now tied over a piece of rubber tubing or roll of gauze, which brings the two muscles and fascia of the external oblique in contact with Poupart's ligament, as shown in Fig. 1. This transplants the cord on top of the fascia of the external oblique.

We then make a slit in the fascia of the external oblique, as shown in Fig. 2, to receive the reflected portion of fascia, which is turned back to expose Poupart's ligament. This reflected portion of external oblique fascia is then pulled into the slit, as shown in Fig. 3, and acts as a covering of the cord. When these sutures are tied we have the wound completely closed. These sutures may be made to come out above the wound and tied over a roll of gauze, as the deep sutures, and the wound then closed by a subcuticular.

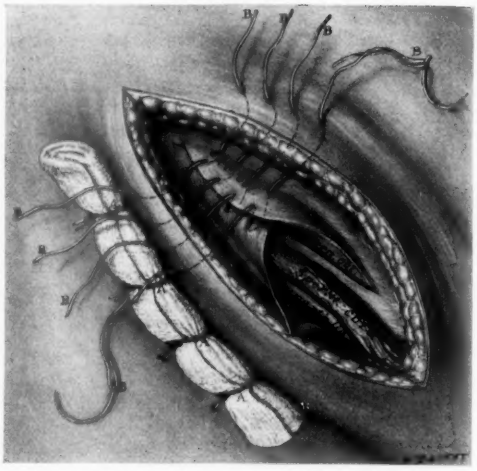

Fig. 3. This figure represents the next layer of sutures inserted so as to cause the overlapping of aponeurosis of external oblique and when the sutures are tied the wound is closed. If preferred the sutures may be brought out above the wound as the deep sutures are brought out below and the wound closed with a subcuticular suture. The cord rests on the aponeurosis of the external oblique and is covered by the same. Referring to the above figure we have covering our hernial opening: Skin, subcutaneous fat, aponeurosis of external oblique, cord, aponeurosis of external oblique again, internal oblique, oblique and transversalis muscles.

After completion we have over the weak spot, or what was the hernial opening, skin, subcutaneous fat, fascia of external oblique, cord, fascia of external oblique again, internal oblique and transversalis muscles, and peritoneum. We have no buried sutures from which to fear infection, and we have a stronger abdominal wall than normal.

The stitches are usually left in for twelve days. It is essential to have a good quality of silkworm gut, as it is easy to break where it is tied over the roll of gauze.

During the past 16 months I have performed 38 herniotomies after this method; have been able to follow up the greater number of these cases and none have recurred. More than two-thirds of these were in men engaged in manual labor and the abdominal wall was subjected to unusual strain.

TRANSACTIONS OF SOCIETIES

AMERICAN SURGICAL ASSOCIATION

MEETING OF 1909, HELD AT PHILADELPHIA, PA., JUNE 3, 4, AND 5. THE PRESIDENT, DR. C. B. G. DE NANCREDE, OF ANN ARBOR, MICHIGAN, IN THE CHAIR

The Association met in the Clover Room of the Bellevue–Stratford Hotel, and was called to order in scientific session at 10:30 A. M.

ADDRESS OF THE PRESIDENT

DR. C. B. G. DE NANCREDE, of Ann Arbor, Mich., said that the statistics dealing with extirpation of the scapula were misleading, because cases which were primary in the scapula and secondary in the soft parts, those which were done in two stages, and those performed for benign growths, for caries, injury, and tubercular disease, were all included in the statistics usually given. Indeed, in one paper, an operation where the scapula was removed after death was included. There was no discrimination in any of the tables between operative recovery and the end results, investigation showing that a large number of those that were reported as having recovered had later died of recurrence of the trouble. The three year rule had been ignored in like manner, for it was well known that this was utterly unreliable for any form of malignant disease. One case had an inoperable recidive at the end of five years, yet this was included by the reporter as a recovery. Recidives were often the source from which generalization took place. Careless examination of the patient and the expectation of finding marked difference between the physical signs in the two lungs often led to the opinion that pulmonary metastases had not occurred, the true explanation being that metastases were so numerous and so small and finely distributed that the physical examination was unreliable.

The death-rate probably was now lower with the new methods of operating, saving blood and preventing shock, and it was possible therefore that some of those who died in the past from shock and hæmorrhage might have shown a few permanent cures if they had survived. It was a matter for future investigation to determine whether interscapulothoracic amputation would not give more permanent recovery. The usefulness of the upper extremity after the removal of the scapula was usually so good that, of course, hesitation was felt about doing the operation just mentioned where the whole upper extremity was ablated.

The details given in the tables seemed to warrant the above conclusions, which had proved to the author, of course, a surprise. There was only one case on record where the details were obtainable sufficiently long to prove that it was really a cure, being entirely well at the end of eight years. A few more were probably cured, although not reported long enough to be past the time that recidives had been noted.

A vast number of those that were claimed as cured had been observed from only a few weeks to a few months and then lost sight of.

Operation for pure enchondroma and other diseases demanding excision of the scapula present very favorable results.

CHRONIC INTESTINAL STASIS

MR. W. ARBUTHNOT LANE, of London, England, referred to his earlier communications on this subject, with special reference to the removal of the colon for chronic constipation, and described the technique of the operation. (See Surgery, Gynecology and Obstetrics, Feb., 1908.)

In nine cases he had removed the colon, and of this number one patient died from the bursting of a small abscess in the original cavity. In a number of private cases division of the ileum at its junction with the large bowel was effected, with no death from the operation *per se*. Removal of the large bowel was a serious operation; but the danger attending its performance varied with the degree of toxæmia. He did not, however, recommend or advise such a radical operation until all other measures, medicinal and hygienic, had been tried. The danger of the operation could be reduced very materially by the subcutaneous injection of a large quantity of normal salt solution immediately before operation.

DISCUSSION

DR. J. C. BLOODGOOD, of Baltimore, said that chronic constipation had in some instances an

anatomical basis. He would call attention to the use of the X-ray and injection of bismuth as a method of diagnosis in these cases. He believed this method would be used more frequently in the future in the class of cases under discussion, as it was used now in cases of aneurysms, bone lesions, etc. A day or two ago he operated on a patient who for three years had had pain in the lower abdomen. On exposing the right side some of the adhesions referred to by the essayist were found, and on exposing the left side the sigmoid could be lifted out of the abdomen as easily as one could lift out a loop of the small intestine. The anatomical lesion in this case was an enlarged sigmoid from fæcal matter. The sigmoid itself was normal. The mesentery was normal. These adhesions were separated with good results. In another case the adhesions were more pronounced. In this case the bowel was not resected, the patient being relieved by medical treatment. There was no difficulty in resecting the intestine and performing lateral anastomosis, but if one could demonstrate early in the cases a band or adhesion or the anatomical condition, and medical treatment would relieve it, more good would be done than by resecting the sigmoid.

Dr. Thomas W. Huntington, of San Francisco, said that it had seemed to him for many years that very many of these cases of enteroptosis, bearing especially on the large bowel, could be avoided by two things: (1) Careful attention in early life to the emptying of the bowel. It was a fact that in a large number of people in the hands of the average general practitioner a more or less permanent accumulation of fæcal matter in the large bowel had been overlooked. (2) He believed this accumulation of fæcal matter was due to a definite cause. Take, for instance, an appendix which had not given rise to the ordinary symptoms, it had caused sufficient irritation to interrupt the peristaltic wave and to bring about a condition of the bowel which was extremely disastrous in the carrying of residual material. Careful attention in early life to the emptying of the bowel would obviate the possibility of the occurrence of prolapse of the sigmoid, and by loosening up the large bowel and changing its environment or its relation we might avoid early operation for a pathological condition which existed. Careful study and search for the pathological condition, as an obscure appendix, would enable us to escape from the later consequences which the author had portrayed.

Dr. Arthur Dean Bevan, of Chicago, said that, as he understood the essayist, he made a plea for operative intervention in cases of chronic constipation. He would insist upon intestinal obstruction before he would undertake such an operation as the removal of a part or the whole of the colon for chronic constipation. The large and small bowels perform their functions admirably sometimes in spite of the presence of extensive adhesions. That was evident after many operations. We should discuss this as a sort of borderline subject in which in our cases we should call into consultation the internists. What would internists think of surgeons if they took the position of treating chronic constipation by resection of the large intestine or by anastomosis? Most of these cases could be very much better handled by our internists by exercise, by hygiene, etc., than by extensive surgical operation. Personally, he protested against advocating an operation so extensive as the removal of the colon for chronic constipation itself, and should insist upon reserving the operation for absolute intestinal obstruction.

Dr. John F. Binnie, of Kansas City, Mo., understood Mr. Lane as only advocating this operation for chronic intestinal stasis after all other measures of treatment had failed. Personally, he had practiced cecostomy in a number of these cases with very fair temporary results, but had not observed them sufficiently long to determine whether the results would be permanent or not.

Dr. John B. Roberts, of Philadelphia, agreed partly with what Dr. Bevan had said, because of some recent experience he had had with intermittent obstruction of the bowel due to kinks and various other causes; but he realized that the essayist did not propose to open the abdomen of everybody for the relief of chronic constipation. After the internists had failed to afford relief to these patients by exercise, medical and dietetic measures, then surgical operations might do good in the class of cases discussed. He was greatly pleased with the broad philosophical view which Mr. Lane had given of the whole question.

Dr. Maurice H. Richardson, of Boston, said that we must approach the surgery of the large intestine in cases of this kind, as Dr. Bevan had said, from the symptomatology of chronic intestinal obstruction. We all saw cases of complete chronic intestinal obstruction which demanded a most thorough radical operation. In one of his cases of complete volvulus of the sigmoid which threatened life the sigmoid filled the whole abdomen, producing an acute obstruction of the bowel which necessitated operation.

Dr. W. B. Coley, of New York, said that every severe case of acute intestinal obstruction required operation, and the operation was attended with great danger. Of nine cases operated on, death followed in all of them. He reported a case of

volvulus of the sigmoid to the New York Surgical Society, which was preceded by attacks of chronic intestinal obstruction, ending with an acute obstruction. He operated on the patient on the ninth day, when he was almost moribund, with great distention of the abdomen, high pulse, elevated temperature, etc. He opened his abdomen under cocaine anæsthesia (as he could not stand a general anæsthetic) over the sigmoid, relieved the obstruction, and the patient recovered.

MR. LANE, in closing, wished it to be distinctly understood that this form of operative treatment was suggested only after all other measures had failed.

THE FÆCAL ORIGIN OF SOME FORMS OF POST-OPERATIVE TETANUS (ANO-RECTAL, INTESTINAL, PUERPERAL, GENITAL, AND LOWER PELVIC OPERATIONS), AND ITS PROPHYLAXIS BY PROPER DIETETIC OR CULINARY MEASURES

DR. RUDOLPH MATAS, of New Orleans, in a paper on this subject, drew the following conclusions:

1. Notwithstanding the vast increase in our knowledge of the etiology, pathology, and prophylaxis of tetanus since the discovery of the drumstick bacillus of Nicolaier, a certain, not fully determined, number of post-operative deaths from this infection occurs in seemingly clean surgical cases, which has not been satisfactorily accounted for.

2. Whilst it has been fully and irrefutably demonstrated that the regional liability of the exposed parts of the body to tetanus (feet, hands, legs, forearms, arms, face, neck, etc., etc.) is directly proportional to the degree of surface contact with tetanus-bearing (tetaniferous) matter (earth, maure, dust), the origin and regional distribution of accidental and post-operative tetanus in the concealed parts of the body (protected from surface exposure) has not been sufficiently investigated or recognized, surely not sufficiently insisted upon in accounting for post-operative deaths in which the rules of surgical asepsis have been apparently well observed.

3. Abundant experience has shown that while the risk of tetanus infection can be absolutely eliminated in all operations upon sterile tissues in which a rigorous post-operative asepsis can be maintained until healing has occurred, this liability cannot be removed in those regions in which post-operative asepsis cannot be secured.

4. In order of importance, next to the feet and hands and other exposed parts of the extremities, the injuries and surgical operations in those regions of the body which are most exposed to fæcal contamination, are the most liable to tetanic infection. In this category we will place the ano-rectal region, perineum, female genito-urinary tract, male genitals, especially scrotum, lower pelvic region, including buttocks, sacro-coccygeal region, groins, thigh, knee, upper leg, on their posterior surfaces especially; after operations on the intestines, artificial anus, etc., in all of which post-operative fæcal contact is either constant or unavoidable, on account of proximity to the intestine. In considering this topographical distribution we are excluding the direct but unconscious transmission of fæcal matter to distant parts of the body by the soiled fingers of the patient himself, or of his attendants.

5. The careful attention to the sterilization of instruments and the disinfection of the hands, compelled by the rules of modern surgical, obstetric, and veterinary practice have enormously reduced the liability to tetanic infection, even when those parts of the body are involved which are most exposed to fæcal contact, by eliminating the direct inoculation of wounded surfaces with contaminated instruments and hands. However, the occasional post-operative deaths, which occur from time to time in the practice of competent and clean surgeons, clearly point to another source of danger which is not dependent upon defects of technique or contaminated material; e. g., imperfectly sterilized catgut, but to other sources of infection outside of, and apart from, the operative act itself which have not been adequately appreciated.

6. This hitherto unrecognized or disregarded factor in the causation of post-operative tetanus, at least in regions liable to fæcal contact, is the direct contamination of the alimentary canal and its contents with living tetanus bacilli and their spores, swallowed in raw, uncooked vegetables, berries, and other fruits which are cultivated in fertilized or manured, i. e., tetanized soil.

7. It may be a mere coincidence, but it is a fact, that in all the cases of post-operative tetanus occurring after operations in regions liable to fæcal contact, which have been investigated by the author (two in his own practice), the patients had eaten copiously of uncooked vegetables immediately before the operation. The vegetable menu in these cases corresponded with the laboratory findings in regard to the vegetables found most frequently contaminated with tetanus germs and spores, viz., celery, lettuce, chicory, watercress, cabbage (cold slaw), radishes, turnips, carrots, tomatoes, and other green vegetables, strawberries, blackberries, and other berries and fruits which are grown in the soil or brought in contact with it, and which are largely consumed raw in an unavoidable contaminated state.

8. The tetanus bacillus and its spores are known to survive the passage through the intestinal canal of the domesticated animals, especially the herbivorous horse and cow, and the dung of these animals is a perpetual culture medium for the tetanic bacillus, swallowed constantly with the grass of the pasture and the fodder of the stable; not only are the bacilli ejected alive, but their virulence and activity are probably intensified by their temporary residence in the favorable conditions of the lower intestinal tract. This survival of the tetanus germ in a virulent state is fully demonstrated by the experiments of Sormani, Sanchez Toledo, Veillon, Hoffman, etc., who demonstrated that the diluted excrement of the horse and cow, injected subcutaneously and otherwise, will kill rabbits in from five to six days with all the symptoms of this disease. These and other authors have fully demonstrated that the spores of the drumstick bacillus resist the action of the digestive juices. It has also been demonstrated that the tetanus-laden fæces of the healthy horse and cow are capable of producing fatal tetanus when brought in contact with wounded surfaces in these animals.

9. In view also of the fact that five per cent of all normal men harbor the tetanus bacillus of its spores in an active state in the intestinal canal, and that the percentage of contaminated individuals is increased to twenty per cent in hostlers, stablemen, dairymen, drivers, etc., the possibility of tetanus from fæcal contact must always be kept in mind, especially when operating upon the anorectal region, perineum, and genitourinary organs of both sexes in unprepared subjects.

10. The author fully recognizes that the normal defenses of the organism against intestinal infection, are, in healthy individuals, usually sufficient to protect it, even if the living tetanus bacillus has been freely introduced into the alimentary canal with the ingested food. It is only through the salutary and preservative influence of the protective mechanism, which largely neutralizes the most virulent infections in the alimentary canal, that we can account for the great numbers who escape when operations are performed in the recognized tetanogenic regions. It is evident, however, that even if tetanus infection is a comparatively rare post-operative sequence, it is well worth the observance of the simple precautions required to avoid this deadly accident. Precautionary measures would be more than justified if only one in ten thousand operative cases could be saved from the almost certain death which follows when this form of inoculation occurs after operation.

11. In accordance with the preceding statements, and his own convictions, the author has taught and insisted in his own practice, since his last and second post-operative death from tetanus occurred five years ago (perineoplasty and hæmorrhoids), that no patient should be brought to operation without antitetanic preparation, whenever an operation is to be performed upon parts in which fæcal contamination is unavoidable (hæmorrhoids, fissure, fistula, stricture, etc.)

12. This antitetanic preparation is very simple and consists of (*a*) purgation three days before the operation; (*b*) the suppression of all raw, uncooked food, especially green vegetables, berries, and other fruits for the same period of time before the operation. In emergencies, when dietetic preparation is impossible, 10 c.c. of tetanus antitoxin are injected subcutaneously at the time of the operation, while the patient is still under the anæsthetic.

DISCUSSION

Dr. John E. Owens, of Chicago, wished to mention the case of a woman he saw a few years ago, past middle age, suffering from tetanus. She had no appearance of a wound, but two or three days before she consulted him she had a tooth pulled. Before the attack of tetanus began she had been eating celery, of which she was very fond, and he had no doubt the attack resulted from eating the uncooked celery.

Dr. Nathan Jacobson, of Syracuse, N. Y., recalled one case in which tetanus developed after an operation for hæmorrhoids, which was performed by a so-called rectal specialist, the so-called injection method having been resorted to. It was thought the tetanus was due to carbolic acid or to the ligature material that was used. In other cases of tetanus he had seen following operations on the anorectal region trismus was a late manifestation.

Dr. W. H. Hutchings, of Detroit, Michigan, had treated three cases of post-operative tetanus. In one the tetanus followed an abortion. In the other, tetanus followed injuries to the hand. In a third, tetanus followed an apparently clean operation for suprapubic shortening of the round ligaments. It developed twelve days after operation; but the wound healed by primary intention. All three patients recovered.

Dr. Joseph Ransohoff, of Cincinnati, Ohio, a few years ago did considerable ano-rectal work, but never saw a case of post-operative tetanus, with one exception, and that was in the practice of a colleague. The patient had been curetted, and fuming nitric acid introduced into the uterus. Acute tetanus developed; but there was no trismus, but an open mouth, a symptom he had not

seen before. In every case the alimentary tract should be thoroughly emptied.

DR. MAURICE H. RICHARDSON, of Boston, had never seen a case of post-operative tetanus. It must be very rare when we considered infections through the alimentary canal, as acute appendicitis cases, enterostomies, and other operations by which the large intestine was opened.

DR. ARTHUR DEAN BEVAN, of Chicago, asked if it was not possible that tetanus varied considerably in different localities.

DR. ARPAD G. GERSTER, of New York, said that thirty-two years of surgical practice in two hospitals had failed to produce a single instance of post-operative tetanus to his knowledge.

DR. BEVERLY MACMONAGLE, of San Francisco, California, in an experience extending over thirty years, had seen but one case of tetanus following operation. In this case a trachelorrhaphy was done; catgut was used, and he had no doubt infection came from the catgut. He had operated in the houses of Italians and Spanish, where they had a horse or a pig, or a cow adjoining their rooms, yet he had not had a case of infection from the tetanus bacillus in any of those bad surroundings.

DR. EDMOND SOUCHON, of New Orleans, remembered distinctly losing a young girl upon whom he operated for hæmorrhoids. She died on the eighth day after the operation, from tetanus.

DR. F. H. GERRISH, of Portland, Maine, some twenty-five years ago, had in close proximity to one another two cases of post-operative tetanus. One patient was a child in the teens, and tetanus followed an operation for necrosis of the tibia; in the other tetanus developed after ligation of hæmorrhoids. Tetanus seemed to come in waves. In the year these two cases occurred tetanus was quite prevalent. Three years ago they had in the hospital with which he was connected sixteen cases of tetanus in the course of eighteen months, and they were still in doubt as to the occasion for those cases.

DR. J. COLLINS WARREN, of Boston, thought it ought to be said in this discussion that tetanus was to a certain extent a tropical disease; that latitude had some influence upon the growth of the bacillus of tetanus, and that in the tropics it grew more luxuriantly than in temperate zones.

DR. S. STILLMAN, of San Francisco, could see how there was danger of tetanus developing after ligature operations for hæmorrhoids. That was the experience of Lane in the navy on the Pacific Coast, at Panama, and in the early days in San Francisco. The danger was a real one at that time, and his experience was extensive in those days, and it also happened in his own work a number of times; but no particular precautions were taken to guard against tetanus developing.

DR. ALBERT VANDER VEER, of Albany, N. Y., said that his experience did not bring to his mind a single case of tetanus in connection with operations upon the rectum. The cases of tetanus seen in army practice generally resulted from shell wounds in which there was a great deal of dirt carried into the wounds; the wounds were badly lacerated, and they saw many cases of tetanus.

DR. GEORGE E. BREWER, of New York, saw no objection to using serum as a prophylactic in these cases. They used it at the Roosevelt Hospital in all cases of injuries to the hands and feet. Seven years ago they had 16 cases of tetanus occur in about two months in the summer following injuries of the hands and feet, and after that they made a definite rule in such cases to give them an immunizing dose of antitoxin, and since they had adopted that practice they had never had a case of tetanus develop there.

DR. DUDLEY P. ALLEN, of Cleveland, Ohio, said that they had had a number of cases of tetanus at the Lakeside Hospital in Cleveland from the use of toy pistols. In every case where the wound was opened early and packed the patient recovered. The patients whose wounds were not opened early and packed died.

Dr. C. B. G. DE NANCREDE, of Ann Arbor, said that there were certain sections of the country where tetanus was unknown, while in others a few miles distant the disease was rife; at least, the germs of the disease could be found in the soil. For the past eleven years in his lectures he had warned his students about the dangers of unripe fruit as a possible source of tetanus.

DR. ROBERT G. LE CONTE, of Philadelphia, said that some fifteen years ago tetanus developed in a case that was operated by a colleague in Philadelphia. The disease developed on the eighth day following an operation on the perineum, and resulted in death. At the Pennsylvania Hospital they formerly had a number of cases of tetanus, but since they had made it a rule to give patients with injuries of the hands and feet, or patients with suspicious-looking wounds, an immunizing dose of antitetanic serum, they had not had tetanus develop.

DR. MATAS, in closing, said that at the Charity Hospital, New Orleans, there was no case of railroad injury that was contaminated with dirt that was not given antitoxin or antitetanic serum. In answer to Dr. Bevan, as we approached the tropics the prevalence of tetanus was increased. It was less prevalent in northern than in southern latitudes.

THE PARATHYROID QUESTION

Dr. Charles H. Mayo, of Rochester, Minn., said that for more than fifty years reference had been made by various authors to peculiar gland bodies that were quite regularly associated or connected with the thyroid bodies. As stated by careful observers, the glands were four in number, usually without the true capsule of the thyroid gland. They were six to seven m. m. long, three to four m. m. wide, and two and five-tenths m. m. thick. The pathological changes were of simple type, i. e., degenerations, hemorrhages, cysts, and seldom tumors. In fact, there were but few tumors of the parathyroid reported, most of these being found at autopsy, and all were benign, mostly adenomas. From such reports, it would appear that these glands as compared with other organs and lesions were singularly free from serious diseases, especially those of a surgical nature.

The association of function of the glands like the thyroid, parathyroid, thymus, suprarenal and others became more marked as continued investigation disclosed the various changes consequent on disease or removal of the various glands. It was quite possible that the human being with four parathyroids had some to spare, and that if those on one side were preserved, no untoward consequences would follow. This phenomenon had been noted in other double structures — kidneys, ovaries, etc.

Operations upon cases of hyperthyroidism were usually confined to one side, and the blood supply being free, there was but little danger of subsequent hypothyroidism, the greatest danger occurring from operations on both sides and from secondary operations on the remaining side in single goiter.

Should tetany follow the removal of the parathyroids, the indications were to administer calcium salts to maintain life until parathyroid glands could be secured, transplanted and function obtained, as by this means it might be possible to tide the patient over into a chronic state which might later become a cure. In nearly 1,200 operations for goiter they had seen no tetany.

EXCISION OF THE LARYNX FOR MALIGNANT DISEASE

Dr. James Bell, of Montreal, reported 12 laryngectomies. In his experience partial operations on the larynx were not satisfactory. Excision of the larynx was a safe operative procedure. In seven of the twelve cases operations were done for intrinsic, far advanced cancer of the larynx; in five for primary disease of the organ. Of the twelve cases operated on, seven recovered.

DISCUSSION

Dr. W. W. Keen, of Philadelphia, in 1898, selected as the subject of his presidential address, "Total Laryngectomy," and in it he reported a case of excision of the larynx. The man was now perfectly well, it being eleven years since the operation was done. He recommended at that time that the patient be kept in the Trendelenburg position to prevent aspiration pneumonia.

Dr. George E. Brewer, of New York, said that the dangers from the operation of excision of the larynx were: (1) Aspiration pneumonia; (2) extension of the infection downward along the muscular and fascial planes of the neck toward the mediastinum; (3) too long deprivation of food in old people who were in a bad general state. He believed in early feeding. He introduced a nasal tube into the lower part of the esophagus, and began feeding as soon as the patient came out of the ether. He began the use of water in about six hours after operation, gave eggnogs and concentrated food from the start.

Dr. Roswell Park, of Buffalo, said that his first case of laryngectomy was operated on about twenty-four years ago, and the patient nearly died of iodoform poisoning. He was afraid to use iodoform after that, and in a later case employed subnitrate of bismuth. This patient died. An autopsy was made, and he found the lining of every bronchial tube smeared with bismuth that had formed a paste, so that the patient died of asphyxiation from the bismuth.

Dr. N. B. Carson, of St. Louis, after detailing five cases in which he had resorted to laryngectomy, said that rectal anæsthesia added very much to the comfort of these patients.

Dr. George W. Crile, of Cleveland, wished to report 20 total laryngectomies. There were two immediate fatalities in the first 8, but none in the last 12. The ultimate results were quite unsatisfactory. The oldest case was living between 15 and 16 years after operation; another 5 years after operation; one was alive four years after operation; one after three years, and the remainder had been operated on too recently to be considered at this time.

Further Observations on Transfusion, with a Note on Hæmolysis. Dr. George W. Crile, of Cleveland, Ohio. See page 16.

The Preservation of Dissections of Surgical Anatomy with Permanent Color of Muscles, Vessels, Nerves and Organs, by a New Method, by Dr. Edmond Souchon, of New Orleans, La. See page 25.

THORACIC SURGERY

Professor Friedrich, of Marburg, Germany, reported 11 cases of unilateral phthisis in which he had resorted to extensive multiple resection of ribs. In two cases of multiple tuberculosis he performed

total pleuropneumolysis, and in four partial pleuropneumolysis. He had not lost a single case from this operation.

Dr. William S. Halsted, of Baltimore, detailed some experimental studies he had made with reference to lung surgery.

Dr. Charles A. Powers, of Denver, discussed surgical measures designed to relieve pulmonary tuberculosis.

Dr. Leonard Freeman, of Denver, said that collapse of the lung might be obtained in several ways: (*a*) By the production of artificial pneumothorax according to the methods of Murphy and others. (*b*) By extrapleural resection of the ribs below the first part of the cartilages to the spine, including the periosteum. (*c*) By removal of portions of some ribs, with periosteum along the axillary line. (*d*) By resections of portions of several ribs and periosteum directly over the diseased part of the lung, usually a cavity near the apex. (*e*) By a similar operation, without removal of the periosteum, followed by external pressure by means of a truss.

He described an operation which he had done in two cases, with encouraging results.

Dr. A. Vander Veer, of Albany, said that the hypodermic syringe, with long needle, was of value for exploratory purposes and a safe instrument for a good general practitioner to use when in doubt as to the nature of the lesion that was present. Repeated use of the aspirator was not to be condemned so long as the fluid remained sterile, and was the preferable method of treatment in malignant cases. Where we had some malignancy in which the effusion was distressing to the patient, the use of the aspirator afforded great relief. The use of the trocar and drainage tube was advisable if it was shown the aspirator was no longer affording benefit. Resection of the ribs was necessary when no improvement took place with ordinary drainage tube. The latter operation should be done early in order to protect the lungs from unnecessary pressure and relieve adhesions which, in the young, become so detrimental in causing spinal curvature.

Dr. C. L. Gibson, of New York, reported an interesting case of tubercular pericarditis in which he succeeded in effecting a cure by means of incision and drainage.

TREATMENT OF FISTULÆ AND ABSCESSES FOLLOWING OPERATIONS FOR EMPYEMA OF THE THORAX

Dr. A. J. Ochsner, of Chicago, in this paper, illustrated the value of the injection of Beck's paste into persistent sinuses and abscesses following operations for empyema of the thorax. A tabulated list of 14 cases treated by the author by this method was given in the paper.

Two formulas were in use: No. 1, consisting of one part of arsenic-free subnitrate of bismuth and two parts of sterile amber vaseline, had a lower melting point than No. 2, which consisted of thirty parts of subnitrate of bismuth, sixty parts of amber vaseline, and ten parts of paraffin of a sufficiently high melting point to cause the mixture to maintain its form at the temperature of the body.

No. 1 was used daily or every second day until the sinus or abscess was practically free from pus; then No. 2 was used, at first every second day, and later less frequently, until healing was completed. These mixtures were injected at 110° to 120° F., by means of an ordinary large glass syringe. Only just enough force was used to fill the cavity. The outer opening was closed with a gauze plug.

The remarkable part of the treatment lay in the fact that cases in which the abscess cavity communicated with a bronchus would heal quite as rapidly and as perfectly as other cases, and that symptoms of sepsis disappeared rapidly, and that in most cases in which there was no communication with the bronchi the discharge from the sinus soon became sterile.

VISCERAL PLEURECTOMY

Dr. Alexander Hugh Ferguson, of Chicago, read a paper on this subject which will appear in a later number of Surgery, Gynecology and Obstetrics.

Dr. Charles H. Peck, of New York, reported a case of stab wound of the heart in a colored girl. The wound was sutured successfully, and the patient was well, twenty-four days after the operation.

Dr. Willy Meyer, of New York, detailed a new method of esophagogastrostomy for intrathoracic resection of the esophagus.

The Prevention and Treatment of the Sequels of Perineal Prostatectomy. Dr. James E. Moore, of Minneapolis, Minn. See page 27.

SUPRAPUBIC PROSTATECTOMY

Dr. Arthur Dean Bevan, of Chicago, said splendid results had been obtained by performing both the subrapubic and perineal operations, and considering the ages of the patient upon whom these operations had been done the mortality was low. Suprapubic enucleation of the prostate had the widest field of usefulness. All things considered, the cure was more complete by the suprapubic than by the perineal route. The suprapubic was less dangerous and less formidable than extensive perineal dissection. There was no injury done to the musculature by the suprapubic route or perineum; there was very little danger of injuring the rectum, and little probability of stricture or fistula following.

DISCUSSION

Dr. A. J. Ochsner, of Chicago, said that he who had done prostatectomy both perineally and suprapubically a number of times must be impressed with the great ease with which the prostate can be enucleated from above. He had removed a large number of prostates by the perineal route, and quite a number by the suprapubic, and had been impressed with the simplicity and ease with which the operation could be done suprapubically.

Dr. Alex. Hugh Ferguson, of Chicago, said his first 25 cases of prostatectomy were operated by the suprapubic route. Of this number he lost 8. He disliked to return to that method. He now resorted to the perineal route. One could operate on almost any kind of enlarged prostate successfully through the perineum. If accurate statistics were collected, it would be found that the mortality was twice as high by the suprapubic as by the perineal route.

Dr. Joseph Ransohoff, of Cincinnati, said the mortality from the suprapubic operation could be greatly reduced if we made perineal drainage by means of a puncture from above.

Dr. Maurice H. Richardson, of Boston, had seen a good many surgeons operate for the removal of prostates, but never saw one who could see what he was doing to the urethra. Speaking as an anatomist, he had never been able to tell whether he was tearing the urethra to pieces or not when operating perineally or suprapubically. Other surgeons had told him the same thing. The mortality came from the advanced age of patients and not from the operation *per se*.

Dr. S. Stillman, of San Francisco, had a decided preference for the suprapubic operation where the urine was healthy, and where the urine could not be rendered healthy the mortality from the suprapubic or perineal operation could be overcome by following a suggestion which had been given to the surgical profession by Sir William Macewan.

Dr. A. Primrose, of Toronto, said his experience had been confined almost entirely to the suprapubic route. Infection of the pelvic cellular tissue was the cause of mortality in some cases in which the suprapubic route had been resorted to. It seemed feasible to remove the prostate by the transperitoneal route in some cases, and, if necessary, establish perineal drainage.

Dr. John B. Murphy, of Chicago, had operated on the prostate first by the perineal route, and then the suprapubic. Finally from an experience of 123 cases he found he could take out the small, firm, hard prostate more easily and safely from below; while the large, thick, juicy prostate he could remove easier with greater safety to the patient from above.

Dr. Leonard Freeman, of Denver, suggested a method of controlling hemorrhage in connection with the suprapubic operation.

Dr. Moore, in closing on his part, said he expected in five years from now to hear Dr. Bevan read a paper on the complications and sequels of suprapubic prostatectomy. Dr. Murphy stood on solid ground, in that he fitted the operation to the case in hand, and did not try to make every case fit one particular operation.

Dr. Bevan, in closing, said the evidence was quite conclusive in favor of the suprapubic operation from the standpoint of completeness of the cure and the freedom from complications.

A STUDY OF ONE HUNDRED AND THIRTY-ONE CONSECUTIVE CASES OF FIBROID TUMORS OF THE UTERUS DEMANDING OPERATION

Dr. Archibald MacLaren, of St. Paul, Minn., asked, When should a fibroid tumor of the uterus be operated upon? When it commenced to increase in size, or to cause symptoms?

He thought with Richardson that the same rule should be followed as in ovarian cysts or in appendicitis in the interval; but that a small subperitoneal tumor need not be removed if it was not increasing in size.

It was not always possible to be certain that a certain tumor was uterine and not ovarian in origin; the usual error was to diagnose a small ovarian tumor as a fibroid, on account of its smooth, hard, solid feel. The subject of this paper was the last one hundred consecutive hysterectomies for fibroid disease and also myomectomies, 31 in number, which had been performed during this same period of time. The question of first importance was the age of the patient. A young woman should always have myomectomy, if possible.

After a myomectomy the tumor might re-form, or other small growths, which were too deeply buried in the uterine wall, or too small to be palpated, might increase in size, cause a return of the symptoms and necessitate a second operation. This had only occurred three times in his total experience of over 60 myomectomies.

Myomectomy had been done during pregnancy four times, with one miscarriage. He would not advise the removal of a uterine tumor in a pregnant uterus which was producing no symptoms.

In regard to the mortality, there had been 5 deaths in the 131 cases, or 3.8 per cent; 3 per cent in the series of 100 hysterectomies; and 2 deaths in the myomectomies, making 6 per cent. This looked like

an unjustifiable mortality for myomectomy, but as both were accidental deaths in no way due to the myomectomy they ought not to be charged to this operation. The first was due to the giving way of the catgut purse-string suture about the stump of the appendix, which had just been removed. The second death was probably due to the leaking of a gall-bladder which had been opened and drained through a stab wound, several gallstones having been found at the time of the operation for the removal of a fibroid tumor.

One of the principal dangers of myomectomy, as well as hysterectomy, was post-operative hemorrhage. The gradual formation of a hæmatocele, which occasionally followed either operation, should be carefully watched for. He had been in the habit of putting in vaginal drainage at the time of the operation when there was any difficulty in preventing oozing. And twice after myomectomy he had made a vaginal section on the third day, opening up and draining such hæmatomata, with the most gratifying results.

In his earlier work he lost two cases where the puddle of pus in the cul-de-sac was due to the infected, broken-down blood clot which had caused the fatal septic peritonitis, which was not discovered until the autopsy. To the recognition and drainage of these accumulations of blood more than to any one thing did he ascribe his improved results over a few years ago, when he used to find them at the post-mortem.

The danger of a fibroid tumor producing a suppurative pelvic peritonitis was considerable. In the 100 hysterectomies, 3 came to him with pelvic abscesses complicating the tumor, either due to a perforative appendicitis, or to the necrosis of the tumor, or to compression of diseased appendages.

In regard to the method of performing hysterectomy, supravaginal amputation had been the operation of choice, and only in malignant disease or a suspected malignancy had he reverted to complete removal of the uterus, and for two reasons: First, because it was a less dangerous operation in his hands, and second, because he had never seen a fibroid tumor grow in the stump of the cervix after a supravaginal amputation. Large-sized catgut for the vessels, No. 3 or 4, was the best ligature material, or No. 2 double. It was awkward for tying the uterine arteries deep in the pelvis, and much greater force had to be used than would be necessary on the surface, so the ligature must be larger and stronger. It was always wiser to cut the uterine arteries beside the cervix before picking them up, for they lie very close to the ureter. The only time that he had ever injured the ureter was in one of his earlier operations, when the uterine artery was ligated *en masse* before cutting the artery.

DISCUSSION

Dr. Maurice H. Richardson, of Boston, had had a large experience in operating for the removal of fibroid tumors of the uterus, and felt there was a greater danger attending myomectomy for the removal of multiple tumors than hysterectomy. If you were going to give a patient a most safe procedure in a case of multiple fibroids of the uterus, it was better to do supravaginal amputation. This opinion was based on personal experience after many years of operating on these growths.

Treatment of Tetanus. Dr. Willard Hunter Hutchings, of Detroit, Mich. See page 11.

DISCUSSION

Dr. Theodore A. McGraw, of Detroit, said that in one of the cases related by Dr. Hutchings, in which tetanus developed, extreme care was used in thoroughly disinfecting the wound, and when the wound was opened as a matter of precaution against tetanus, everything was found aseptic, yet tetanus developed.

Dr. Wm. H. Carmalt, of New Haven, asked the chemical composition of chloretone.

Dr. John B. Roberts, of Philadelphia, said that we had all realized for many years in our hospital experience that chloral would cure tetanus, but now, with the addition of antitetanic serum, we had a good combination. He would like to know whether chloretone had any relation to chloral, or whether it was similar in its composition.

Dr. Thomas W. Huntington, of San Francisco, had used chloral to the limit in three cases of tetanus and all three patients died.

Dr. A. T. Bristow, of Brooklyn, wished to emphasize the absolute necessity of putting patients with tetanus in a room by themselves, kept absolutely quiet, free from noise or any irritation of any kind; and would recommend the use of chloral and bromides in large doses.

Dr. De Forest Willard, of Philadelphia, said that the only case of tetanus he remembered saving was one in which he kept the patient saturated with chloral for twenty-eight days.

Dr. C. B. G. de Nancrede, of Ann Arbor, said they had a great deal of tetanus in their section of the country. He had saved the lives of a few patients who had tetanus, with chloral. He had never seen any effect from antitoxin after the disease had started.

Dr. Nathan Jacobson, of Syracuse, N. Y., said as to the possibility of controlling tetanus by amputation, a review of the literature taught that

it had little or no effect. As to the manner of introduction of the antitoxin of serum, whether it was introduced intracerebrally, intraspinally, intraneurally, or intravenously, there was practically no difference in the results.

Dr. John E. Owens, of Chicago, said the use of antitetanic serum must be considered in the light of a prophylactic. During the constructive period of the World's Columbian Exposition they had several hundred cases of nail wounds of the hands and feet, and in not a single instance did tetanus develop. Their treatment consisted in opening the wounds freely, curetting them, more or less, then applying 95 per cent carbolic acid, and covering the wound with ordinary surgical dressing.

Dr. J. Ewing Mears, of Philadelphia, said that in a hospital at Ceylon, Cannanea, at the time he visited there, tetanus of puerperal origin was treated with injections of antitoxin successfully.

Dr. Hutchings, in closing, said that regarding the composition of chloretone, when he began using it he did not know what it was, but was impressed with its beneficial action. He asked a chemist how chloretone was made, and he said: "If you will take equal parts of chloroform and equal parts of acetone, and put them in a test-tube, and boil for a minute or two, then add sodium hydroxide, which precipitates the chloretone,—that, when purified, is chloretone." What the chemical composition of it was he did not know. It was very important to isolate patients with tetanus. Mere amputation, without any other treatment, had no effect whatever on tetanus.

Dr. J. M. T. Finney, of Baltimore, presented a paper in which he spoke of transposing skin flap from remote parts of the body from one individual to another. He believed that the application of this principle was feasible.

SURGERY OF THE LARGE INTESTINE

Dr. Wm. J. Mayo, of Rochester, Minn., in a paper on this subject, said that anatomically the large intestine was a connected whole, but embryologically and physiologically it could readily be divided at the splenic flexure into two well-defined parts. The proximal half was derived from the main-gut and was an important part of the nutritive system, as it absorbed about half of the fluids and 10 per cent of the solids. The descending colon and the sigmoid were derived from the hind-gut, had an antiperistaltic motion, and acted as a fæcal storehouse. In the large intestine lymph drainage followed the arterial supply, but the lymphatics were not numerous and in the sigmoid were very sparse. Mobilization of the large intestine for operation was most important, and could be readily accomplished by cutting the outer peritoneal fold, which did not contain important structures, where it was reflected to the abdominal wall and lifted the gut from its bed. In this way the large intestine could be drawn outside the abdominal incision and the cut ends easily approximated after extensive resections. The inner leaf of the mesentery was very long, extending practically to the midline, and contained the arteries, nerves, and lymphatics. After mobilization the arteries should be tied and divided at their origin, and the entire mesentery with the fat and gland cleanly dissected from the deep structures. The right inferior angle of the duodenum must be identified and separated in operations about the ascending colon and hepatic flexure. The ureters were attached to the peritoneum after crossing the common iliac arteries, and must be isolated, especially on the left side, to prevent injury. If a neighboring organ, such as the small intestine, stomach, bladder, or uterus, was adherent, it should be coincidentally resected, providing the disease was still local. In cancer of any part of the cæcum, ascending colon, or hepatic flexure, all of the large intestine proximal to the disease should be removed with at least six inches of the ileum, and an ileocolostomy performed between the proximal ileum and transverse colon. In cancer of the transverse colon, splenic flexure, descending colon, and sigmoid, union must be made between the two segments of the large intestine, not so safe a union as that between the ileum and colon. It could be made end to end if sufficiently covered by peritoneum, otherwise end to side, or lateral, where the peritoneum was sound. If obstruction was marked, the three-stage operation of Mikulicz-Paul was advisable. In low sigmoid cancers the combined abdominal and perineal operation was best. In fleshy males the posterior, and in debilitated females the Quénu-Tuttle operations gave good results in low sigmoid tumors. He reviewed 100 resections, with 12 deaths; for cancer, 61 times, with 8 deaths. Twenty-four were carcinoma of the cæcum and ascending colon, with 3 deaths; transverse colon, including the hepatic and splenic flexures, removed for carcinoma seven times, with 1 death; descending colon and sigmoid excised for carcinoma 30 times, with 4 deaths. For benign disease, 39 times, including inflammatory disease, tuberculosis, diverticulitis, etc., 4 deaths.

RESECTION OF THE SCIATIC NERVE

Dr. Kenneth A. J. MacKenzie, of Portland, Oregon. See p. 30.

OPERATIVE TREATMENT OF FRACTURES

DR. JOHN B. WALKER, of New York, reported 6 cases on which he operated for the relief of deformity following fractures, with good results.

DR. WM. B. COLEY, of New York, reported (1) a case of strangulated retroperitoneal hernia of the intersigmoid fossa, the fourth case recorded; (2) a rare, probably unique case of interparietal ventral hernia at McBurney's point; (3) A case of resection of 4 ft. of small intestine for recurrent attacks of intestinal obstruction following reduction en masse of a strangulated hernia, four months before.

CASE 1. Infant, male, born Sept. 8, 1907; weight 7½ lbs., apparently normal at birth; the only unusual thing was that during the first 24 hours the child cried almost constantly, occasionally spitting up a little mucus; he had two meconium stools, and continued to take sugar water and diluted milk without vomiting; he continued to cry, but at the end of the second day took the mother's milk; there was no satisfactory movement of the bowel after the meconium stools. Seventy-two hours after birth the baby seemed much better and was nursing well. There was slight distention of the abdomen, but no difference in the two sides was noted. Eighty hours after birth the child developed a temperature of 102° and began to vomit. An enema was ordered but the nurse could not pass the rectal tube more than two inches from the anus.

The patient was seen by Dr. Coley 4 hours later, when another unsuccessful attempt was made to pass the rectal tube, it being impossible to get it more than 3½ inches from the anus where it seemed to meet with an obstruction; no fluid could be forced beyond the catheter. The napkins on two occasions were stained with yellowish fæcal matter with no distinct movement. The child grew rapidly weaker and died at 11 o'clock on the 4th day. Though the diagnosis of intestinal obstruction was made, the child was in no condition at any time since vomiting began, to stand an abdominal operation. Autopsy 2 hours after death showed the following conditions:

On opening the peritoneal cavity an immense gush of air with emulsion of fæces poured out; the abdominal walls immediately collapsed. Over a pint of liquid fæces (there was no pus or anything resembling purulent material present) was found lying in the abdominal cavity. The almost entire absence of intestines was immediately noted. In the left side of the abdomen there was a globular tumor occupying the whole space from the brim of the pelvis on a level with the bifurcation of the common iliac artery up nearly to the costal arch. This swelling was smooth, symmetrical, and resilient on pressure. At the lower edge of the swelling there was a semilunar fold of peritoneum, situated a little to the left of the vertebral line on a level with the bifurcation of the iliac artery. This semilunar fold formed the neck of the retroperitoneal sac. The aperature was 1¼ in. in diameter, easily admitting the index finger. It was found that the posterior parietal peritoneum had evidently been lifted forward, forming the hernial sac which contained almost the entire small intestine. The sigmoid turned sharply to the right and the large intestine was entirely on the right side. The intersigmoid fossa must have been abnormally large, perhaps containing most of the small intestine at birth. On the other hand, it is possible that only a portion of the intestine occupied the fossa at birth, and that the child's constant crying forced more and more of the intestine into the sac until virtually all of the small intestine was included, and strangulation occurred later.

Only three other cases of hernia of the intersigmoid fossa have been reported; namely, the case of Eve (British Med. Jour., June 13, '85), McAdam Eccles (St. Bartholomew's Hospital Reports, Vol. XXXI) and Lambret (l'Echo Medicale du Nord, 1897).

CASE 2. Interparietal ventral hernia at McBurney's point. Patient, male, 53 years old, had a left inguinal hernia since childhood, was injured by a horse in a polo match 4 years ago. Shortly afterward he began to have pains in the region of the right iliac fossa which were at first supposed to be due to some trouble with the appendix. He was operated upon for a double inguinal hernia (a direct hernia of the bladder on the right side) in October, 1905. It was at first thought that the pain and discomfort in the iliac fossa were probably due to the hernia, but the condition continued the same as before the operation. A number of examinations were made during the next three years but no tenderness or other symptoms pointing to an inflammation of the appendix were ever found, although the patient localized his pain and discomfort exactly in the region of the appendix. In November, 1908, for the first time, there was detected a swelling, apparently beneath the aponeurosis of the external oblique. On pressure the swelling disappeared with the same sensation that a hernial tumor gives when its contents slip back into the abdomen under the pressure of the finger. The swelling could be made to reappear on coughing; the aponeurosis was apparently normal. The diagnosis of interstitial hernia at McBurney's point was made and operation advised. The operation was performed on Jan. 27, 1909. The

same incision was made as for an appendicitis operation. A normal aponeurosis was found, cutting through which, a tumor the size of a goose egg appeared. This was surrounded by a thick layer of extraperitoneal fat. On cutting through this a hernial sac the size of a large hen's egg appeared. This was opened and found to contain a loop of cæcum. The neck of the sac was situated between the rectus muscle and internal oblique muscle; the opening in the transversalis fascia was about ⅞ in. in diameter. There were no adhesions between cæcum and sac. The sac was entirely removed and the transversalis layer and peritoneum sutured by overlapping. The patient made an excellent recovery and left the hospital at the end of two weeks.

RESECTION OF 4 FT. OF SMALL INTESTINE FOR RECURRENT ATTACKS OF INTESTINAL OBSTRUCTION FOLLOWING REDUCTION EN MASSE OF A STRANGULATED HERNIA FOUR MONTHS BEFORE

Mr. Y., 53 years of age; has always been in good health. Operated upon for strangulated hernia of 8 hours' duration, in January, 1909. A large loop of small intestine was found very dark in color, but as this apparently recovered under hot towels it was replaced in the abdomen. The patient did very well until three weeks after operation when he had slight attack of intestinal obstruction, which recurred sometimes every 5–6 days; the last very severe attack occurred on May 8th. Vomiting quickly followed and persisted, becoming almost fæcal in character. The patient was referred to Dr. Coley on May 10th; he had had a movement of the bowels the day before due to strong purgatives and enemas, after which the abdomen returned to normal and nothing could be felt on palpation. Dr. Coley believed the condition to be one of adhesions with possible constriction of the bowel from partial sloughing, and advised an operation (at as early a date as possible). The patient entered the hospital on the 12th of May and Dr. Coley, assisted by Dr. W. E. Downes, did a median laparotomy. A mass about the size of two fists, situated in the middle and a little to the right side of the abdomen became apparent; it consisted of six coils of small intestine so completely welded together that it was difficult in places to make out the outlines of the separate loops of the small intestine. It was evident that it would be impossible to separate these adhesions, and it was decided to resect the entire mass, followed by a lateral anastomosis. A piece of tape was passed through the mesentery and tied around the healthy portion of the bowel, well beyond the point to be divided. The mesentery was clamped off and sutured by means of fine chromicized catgut. The divided ends of the bowel were inverted and sutured in two layers. The portion removed extended nearly to the ileocæcal valve. A lateral anastomosis was made between the ileum and ascending colon by means of a large Murphy button. Inasmuch as the appendix was found to contain a large, very hard concretion and showed some evidence of congestion, it was removed. The abdominal wound was closed without drainage. Time of operation, 1 hour, 15 minutes. The first two days the patient was given a very small quantity of saline per rectum and a small quantity of water by mouth. On the third day he was given chicken broth and albumin water in ½ ounce portions every 2 hours. The amount of nourishment was gradually increased and at the end of the week he was given solid food. He had very little more reaction than follows an ordinary hernia operation. He passed the button on the 11th day and was up and about the ward at the end of two weeks. The wound healed by primary union.

The condition of the intestine shows that at the time of reduction the bowel must have been reduced en masse; the adjacent loops were so much inflamed that they immediately became adherent and finally welded together in the solid mass seen by the specimen.

SUGGESTIONS FOR THE OPERATIVE CORRECTION OF SYPHILITIC AND OTHER DEFORMITIES OF THE NOSE

Dr. John B. Roberts, of Philadelphia, called attention to the importance of the reconstructive surgery of the external nose. He stated that the cosmetic improvements possible were not fully appreciated by medical men or by the public at large. The inherent difficulty in these operations was obtaining and maintaining sufficient projection of the reconstructed organ and preventing cicatricial closure of the nostrils. The early recognition of syphilitic lesions of the nasal bones and cartilages and the prompt institution of efficient antisyphilitic treatment would prevent the occurrence of many conspicuous disfigurements. Blows upon the nose in childhood often caused dislocation of the nasal cartilages and bones. These lesions were untreated because of negligence in examination immediately after the injury. The frontal method was probably the best for total rhinoplasty. Brachial flaps might sometimes be used with advantage. Portions of cartilage or periosteum from other regions of the body might be used to give rigidity to the tissues transferred to the nasal region. Paraffin injections into the subcutaneous tissues were sometimes used as an adjunct. Loss of the carti-

laginous external nose below the nasal bones was probably best repaired by Keegan's frontal method. Nelaton's frontal method, which consisted in incorporating a portion of costal cartilage in the frontal flap, was valuable when the bony nasal bridge was missing. The author's method of repairing the sunken nose of syphilis with flaps from the cheeks and mid-frontal region was described as a successful operation. Suggestions for repairing irregular deformities of various kinds were made in the paper.

A Method of Combining Exploration and Decompression for Cerebral Tumors which Prove to be Inoperable, by Dr. Harvey Cushing of Baltimore. See page 1.

UNUSUAL CASE OF GUNSHOT WOUND OF THE BRAIN

DR. JOSEPH RANSOHOFF, of Cincinnati, in this paper reported a case of gunshot wound of the brain from a 32-caliber rifle. The patient was shot in the right temple in May, 1899. The immediate left-sided hemiplegia which followed the injury disappeared within a year. Three years later general convulsions supervened, the attacks coming on every three or four months, without any focal point of origin being in evidence. The X-ray showed the bullet split into three parts, one evidently in the zygomatic fossa, one in the temporal fossa, and the largest fragment just within the skull, on a level with the cribriform plate, and probably in or near the cavernous sinus. Later, left-sided paralysis supervened gradually, but he did not see the case again while alive. Death ensued with coma in twelve hours after the onset of the acute symptoms, nearly ten years after the injury. The autopsy revealed an abscess in the right temporosphenoidal lobe, with a small piece of the bullet firmly encapsulated in the abscess wall. The largest fragment shown in the X-ray had become innocuous and embedded in the cavernous sinus.

The following papers were also read: "The History and Microscopical Study of Fifty Consecutive Cases of Excision of the Thyroid," by Dr. Francis J. Shepherd and Dr. Charles E. Duval, of Montreal, Canada; "Sudden Death: A Study of Certain Cases Occurring During Physical Exertion or Psychic Shock," by Dr. John B. Blake, of Boston; "Observations on the Inequalities of the Right and Left Femora," by Dr. A. T. Bristow, of Brooklyn, N. Y.; "Vesico-Intestinal Fistulæ," by Dr. F. W. Parham, of New Orleans.

Owing to lack of time, several other papers were read by title, although the authors were present.

A rising vote of thanks, which was extended to the local members for their hospitality, brought the proceedings to a close.

OFFICERS

The following officers were elected:

President, DR. RUDOLPH MATAS, of New Orleans, La.

Vice-Presidents, DRS. J. M. T. FINNEY, of Baltimore and GEORGE H. MONKS, of Boston.

Secretary, DR. ROBERT G. LE CONTE, of Philadelphia, re-elected.

Recorder, DR. RICHARD H. HARTE, of Philadelphia, re-elected.

Treasurer, DR. CHARLES A. POWERS, of Denver, re-elected.

Member of the Council, DR. C. B. G. DE NANCREDE, of Ann Arbor, Mich.

Washington, D. C., was chosen as the place of the next meeting, in conjunction with the Congress of American Physicians and Surgeons.

MEETING OF THE PITTSBURG ACADEMY OF MEDICINE, MARCH 9, 1909

PRESIDENT F. F. SIMPSON IN THE CHAIR

DR. P. J. EATON: I feel that I speak for you, sir, as well as for my fellow members of the Academy, and those of our friends who have honored us by coming here, when I say that we feel greatly complimented that Dr. Norris and Dr. Stone are here, and if they have received any inspiration from their visit to us, how much greater is our appreciation, and how much greater is our delight at having them here and hearing all of these points. We hope they will take home with them our thanks with our appreciation.

To sum up what has interested me most in these papers would be to give perhaps, the salient points that have been brought out by each of the gentlemen, but that which interested me, perhaps more than anything else in Dr. Norris's was what he said about the test of labor. Having studied the case beforehand and having learned as much as possible about the proportion and disproportion between the fœtus and pelvic canal, we should give the test of labor, and then after an hour or two select that operative interference which will give the best results.

Induced labor as an alternative from the major interference at term is a striking result of the studies. In Dr. Stone's paper the excessive size of the child and the influence of diet on the size of the child; duration of pregnancy and its relation to the size of the child — all have much of interest. The age of the patient as a factor is also one of the particular points. Of course, to those who have studied obstetrics much, the measurement of the head while above the brim in the uterine canal is of very great interest and to one who can successfully do that, whose hands and whose assistants are such that the measurements can be properly made, it is of great assistance. A special point of interest to me is the fact of the floating head at time when the duration of pregnancy is supposed to be about over, and then the study of what is best to be done under such circumstances; and the last point of interest to me was the fact that no case should be allowed to go over time unless there is positively no disproportion between the head and the pelvic canal through which it must come.

The operative interference has been so clearly stated, and the summing up has been so elaborate and so complete by Dr. Miller, that I am sure I can add nothing to that, but I feel that all of us owe to these gentlemen our best gratitude and our best thanks not only for the inspiration they have given us, but for the practical applications of that inspiration which may come to us in the future.

DR. ZEIGLER: Mr. President, Fellows of the Academy and Friends: I have been very much pleased with the opportunity of listening to the splendid papers which we have had this evening and I am sure we are all very much indebted to our guests and to our own Dr. Miller for what we have received. I believe that not only those of us who are doing this work as a specialty, but also the general practitioners, many of whom are here and by whom the major part of obstetrics will probably always be done, will be very much benefited.

As the subject has been so thoroughly covered, I can add nothing new and can hope only to emphasize a few things that have been brought out. Of prime importance is the study and care of our patients during pregnancy. The pregnant woman should be under the watchful care of a competent and conscientious physician from the beginning of her pregnancy. No physician should accept the responsibility of caring for a patient during her confinement who refuses an examination during pregnancy. An early examination should always be made to determine the general health of the patient, the condition of her muscular, vascular, respiratory, cutaneous, and urinary systems, and a pelvic examination should always be made to determine of a certainty the presence or absence of pregnancy, the position of the uterus, the condition of the other genital and pelvic organs and the character of the pelvis itself in order that impossible things may not be expected, and that certain operations and methods of delivery may not be undertaken which cannot succeed.

And in multiparæ a thorough knowledge of the previous pregnancies, labors, and puerperiums may be indispensable to an intelligent and safe conduct of the approaching confinement. It is not a very unusual thing for patients to go to term without a single examination having been made. I have in mind a patient who came to me from Alabama a few weeks ago to be confined, who was supposed to be within two months of term, but who was absolutely not pregnant at all. She was delivered in Pittsburgh thirty years ago and has never been pregnant since. She is fifty years old and menstruated normally for the last time

seven months ago. Her physician, who made no vaginal examination, assured her that she was pregnant, and that he heard the fœtal heart sounds which were said to be of excellent quality. This same thing happened to a Pittsburgh woman in care of a Pittsburgh physician less than a year ago.

In regard to Dr. Stone's paper, there is one thing I want to speak about. I am of course aware that the histories of a few cases are not sufficient evidence that a regulation of the diet will influence the size of the child and modify the course and termination of labor. I have nevertheless had such uniformly gratifying results in a number of selected cases that I am very enthusiastic in further study of the subject. I believe that the diet of every pregnant woman should be carefully regulated and that within certain rational limits it should be restricted, not only as to the quality of food taken but as to the quantity as well. The vast majority of pregnant women with good appetites eat entirely too much food and drink more water than is either necessary or good for them. As a result the organs of elimination are overtaxed and injured, metabolism is altered, oxidation is incomplete, large quantities of fat are deposited in the tissues, and the patient becomes dull, listless, and easily tired, with the result that exercise, which is so important, becomes a burden and even impossible. The class of cases in which I have had the best success with a regulated and restricted diet is made up of the large women with normal pelves, who have big appetites during pregnancy, who are fat and get fatter with each pregnancy, who live sedentary lives, and who have big fat babies and hard labors because they have hard work to do and nothing to do it with. As soon as an attempt is made to cut down the amount of food in these cases they complain bitterly of being weak and faint, and unless one has a sure hold upon them he will fail at the very beginning. One will, however, find that as the patient loses in weight, and this is perfectly safe early in pregnancy, the appetite decreases, it takes less food to satisfy it, and strength gradually increases. In this treatment, graduated exercise, of which walking is the very best, is indispensable. If necessary, massage or other form of passive exercises must be given until the new equilibrium is established.

In discussing Dr. Norris's paper I should like to emphasize what he says about carefully studying the pelvis beforehand. There are cases which deliver themselves without the slightest assistance when we least expect them to do so, just as there are others which fail to deliver themselves when we have every reason to expect it.

I therefore feel with Dr. Norris that we can never get away from the test of labor in the vast majority of even doubtful cases, if we are to do the safest and best thing for our patients. I have had three interesting border line cases where induction of premature labor, pubiotomy, and Cæsarean section were weighed against each other. These patients were kept upon rigid diets and everything was done to improve them physically in preparation for the ordeal before them, and this was not easy, as all were crippled and able to exercise only with difficulty. I wish to speak of these cases briefly.

Case 1. Mrs. J. K. S., a primipara, 24 years, 5 ft. 3 in. and weighed 116 lbs. When eleven years old was thrown from a sled while coasting, striking her left knee upon the curbing and causing a severe contusion of the knee and accompanied with pain in the corresponding hip. A week later she developed typhoid fever, which was complicated during convalescence by an inflammatory involvement of the hip joint, resulting in its destruction and followed later by upward and backward dislocation of the head of the bone and with the formation of a false joint. There is good flexion of the thigh but abduction is lost, the member being fixed in marked adduction against its fellow. There is about three inches of shortening and a very decided limp even with a high heeled shoe. The pelvis is generally equally contracted, being also somewhat obliquely contracted on the sound side and having a conjugata vera estimated at 7.5 cm. This patient was finally allowed to go to term as the head persisted in good position, was well flexed and settled into the pelvis. Labor terminated spontaneously after a duration of 25 hours. There were no lacerations, and the baby — a female, weighing 5 lbs. and 4 oz., did very well. The mother is again pregnant about 5 months and is in excellent health.

Case 2. Mrs. M. W. H., a primipara, 30 years, 5 ft. 1 in. and weighed 105 pounds. Fell down stairs when eighteen months old, striking upon the back of her head; followed in 24 hours by paralysis of both lower extremities. Began walking again at four years with crutches. Right leg has fully recovered, but the left is two inches shorter than the right, is much smaller and has remained weak. Patient walks at present with a brace and two crutches. She has a generally contracted flat pelvis with a conj. vera of 7½ cm. The linea innominata can be palpated in their entire length from the symphysis to the promontorium. Cæsarean section was refused and as I did not think it wise to do a pubiotomy on account of the already great pelvic instability, it was decided to induce labor at such time as the head could not

be pressed into the pelvis, according to the excellent method of our guest, Dr. Stone. This was accordingly done at the end of the 37th week. The cervix was carefully dilated with the Bossi dilator to 4½ cm. and the lower uterine segment, cervix, and vagina were firmly packed with iodoform gauze saturated in glycerine, according to the method of the Wurzburg clinic. Pains began in an hour, at six p. m. Thursday, and continued recurring at intervals of 5 to 15 min., and lasting from 20 to 30 seconds up until Sunday noon, except for several hours at two different times when sleep was secured by morphine. At 2 p. m. Sunday the os was fully dilated and the membranes were ruptured. After a hard second stage, lasting 9 hours and 10 min., she delivered herself of a male child weighing 5 lbs. and 7 oz., and 45 cm. long. There were no lacerations, recovery was both rapid and complete. The baby weighed 18 lbs. at four months and 30 lbs. at 22 months. The mother is again pregnant about four months.

Case 3. Mrs. J. S., a primapara, 28 yrs., 5 ft. 2 in. and weighed less than 100 lbs. She was very poorly nourished, small bone structure and of poor developed musculature. As a small child was operated upon three times for extensive tubercular disease of the right hip, which is literally riddled with deep scars. The hip is anchylosed, the thigh is slightly flexed, and firmly fixed in adduction. There is much shortening and the patient is compelled to use crutches constantly. The pelvis is generally equally somewhat irregularly contracted with a conj. vera slightly above 7 cm. The pregnancy was looked upon as a calamity by the family who insisted upon the method of delivery which offered the greatest safety to the mother. Labor was induced as in the previous case at the end of the 36th week, and was terminated after 60 hours by the forceps applied to the head in an occipito-posterior position. There was a second degree laceration of the perineum which was repaired primarily and with excellent results. The puerperium was uneventful. The baby, a girl, weighing 4 lbs. and 9 oz., was very frail for a number of weeks, as it had to be fed artifically, but has finally done very well and now, a year later, weighs 22 lbs.

I do not cite these cases to show what I would do again in this same class of cases, but to recall what is at times possibly and even necessary under given circumstances. That in each of these cases at least, the treatment employed was the absolutely correct one there can be not the least doubt, as the perfect results for both mother and child have demonstrated.

And now as to pubiotomy. Up until the time I left Germany in June, 1905, Gigli had collected 88 cases with two deaths, both in the hands of the same operator and in patients previously infected and in whom the vagina and bladder communicated through lacerations with the pubiotomy wound. Döderlein, who was the first to do pubiotomy in Germany (1903) had done the operation nine times up until June 1, 1905. From August 18, 1904, till June 1, 1905, Leopold of Dresden had done pubiotomy 19 times, and of this number nine were done during the five months of my service in his clinic.

From personal observation and from my study of the literature of the subject I am convinced that pubiotomy is a good operation and that it will have a permanent place in obstetrics. I believe, however, that its field is very limited and that it should be done for the strictest indications only, and then only in skilled hands. It has a definite mortality of at least 2 per cent. Patients have died of infection and hæmorrhage (von Rosthorn). Plebitis, œdema of the vulva, and lochiametra are common occurrences, and the morbidity of the operation, according to the best statistics which I have been able to find, is anywhere from 30 to 60 per cent.

Dr. George C. Johnston: Some use has been made of the Roentgen ray in this connection, and it is possible to get a very good idea, both of the pelvic brim and also of the outlet. If two negatives are made stereoscopically and examined with the Wheatstone reflecting stereoscope, the findings are very much better. The results of this examination are sometimes very surprising; a woman with a small pelvis will frequently be found to possess a birth canal of large diameter. This method of examination should not be employed in early pregnancy, since the liability of interruption of the pregnancy is very great. The danger of producing abortion, however, diminishes with the length of pregnancy, and toward term is probably very slight. Deformities of the pelvis are easily and exactly determined, and if proper technique is employed, there is little if any distortion. I believe that this method will be employed to a great extent as obstetricians become more familiar with its value.

Dr. Stone: About two years ago the subject of pubiotomy was discussed at the N. Y. Academy of Medicine, and at the close of the discussion one man stood up and said that if the operation of pubiotomy was anything at all like what he had heard to-night that was all he wanted to know about the operation. This is the fourth discussion I have heard, and I feel the same way as that man did. Dr. Norris has said if you get a severe hæmorrhage the risk is great; also there are too many things

that may happen. In regard to the technique of Cæsarean section, I feel that I have had some experience that will entitle me to say a word or two. If there is any one thing I thought I knew about the improvement of the technique of Cæsarean section it was to leave the uterus inside of the abdomen and not deliver it outside of the abdominal wall. It makes all the difference in the world with the nicety of the operation in its entire technique.

In regard to the suturing of the uterine wall and the muscles of the uterus, they are in three layers. We know, however, that they run more or less regular and symmetrical so far as one side is concerned with the other, and the most important thing is to make your incision in the uterine wall running exactly parallel with the long axis of the uterus, and in a medium line so that those muscles are cut equally on each side and the contraction of the muscular wall on each side will be equal; otherwise you have a thick wall on one side and thin wall on the other. If you will cut the uterine wall so that the thickness is equal on each side I do not believe that it makes any difference what kind of a suture you use so far as the danger of hæmorrhage is concerned. It is a fact that when the operation was begun the uterus was never sutured at all, and the cases that died were the cases that were operated on after a prolonged labor and where sepsis had begun.

I agree with Dr. Miller in regard to the mortality statistics of induction of labor. The other point Dr. Miller spoke of in regard to infantile mortality is a very important point. The mortality is an entirely different thing when induction is done at the seventh, seventh and a half, or eighth month. I would not want to give you the impression that these actual figures were not of material importance. One week ago the director of one of the largest pathological laboratories in N. Y. told me that almost all of the newborn infants that were brought to his laboratory as material from one of the large maternity clinics were large, healthy looking babies. I thought that was a very significant remark in connection with this subject we are discussing.

I do not know how it is here, but I do know that it is the rarest thing in the world for the general practitioner to examine these cases to ascertain whether there is any disproportion. If they start to making these examinations they will soon learn even in the different cases which method is the best to pursue.

Dr. R. C. Norris: The ability to materially modify the size and compressibility of an infant's head by dieting the mother during pregnancy has not, in my experience, been of value, and I believe the disadvantage when equipment for a difficult labor from the view point of muscular and nervous energy and endurance offsets any hope for change in the infant's head.

I have also had with Dr. Leonard, of Philadelphia, a slight experience with the X-ray for diagnosis of pelvic deformity. A scale properly placed to show in the picture the actual length of the diameters offsets errors due to the perspective of the pictures and offers the most accurate measurements of the diameters, but pelvimetry skillfully employed will tell quite as much, and the palpation of the pelvis to learn the alterations in shape is quite as important as a knowledge of the size in the lesser grades of contraction.

X-ray diagnosis of pelvic deformity has thus far been of very little practical value. In my previous remarks I tried to make plain my belief that Cæsarean section as an elective operation is justly gaining a wider field of usefulness in the higher grades of pelvic contraction. For the borderline cases, that is to say, the cases which offer most careful study from every view point, leave us in doubt as to the necessity for the section, the test of labor must be employed and for this class of cases, the safeguard of aseptic management must be more rigid. It would seem that in such cases, pubiotomy has a field of usefulness and that the future may show that it is a safer operation than Cæsarean section, especially in multipara with delapable soft parts or primipara prepared by artificial dilatation of the soft tissues.

Of one thing I am certain, and that is, after separating the pubic bone, the obstetric operation that follows must be more cautiously, slowly, and skillfully performed if we wish to prevent extensive lacerations and the unfortunate sequels noted in the literature, many of which I believe have resulted from too hasty operative treatment. This is especially true of occiput-posterior positions forcibly rotated.

For the third general class of cases, i. e., those of yet lesser degree of disproportion, the relatively late induction of premature labor will give most satisfactory results.

It is true that in many such cases a spontaneous labor at term would doubtless occur, but in some it would not, and it is to aid that number that all such cases are so treated. In maternal and fœtal mortality, I believe, from my own experience, will not thereby be increased, provided the selection of the cases has been guided by an obstetric wisdom gained from experience in this class of cases. An entire evening would well be given with discussion of the technique of these three important opera-

tions, and I can therefore only touch upon a few salient points that my experience has brought me and in closing my remarks I can not do better than refer to these. First, as to Cæsarean section — I cannot agree with Dr. Stone that it is best not to lift the uterus through the abdominal incision before incising the uterus. My practice is to do this very thing and to thoroughly protect the abdominal cavity by gauze, towels, or what I prefer, rubber dam, closely applied about the neck of the uterus. The most important step in Cæsarean section, and the one following which, like an intestinal anastomosis, the surgeon gets what he deserves, is the care with which the uterine incision is made and closed. The danger points are the extremities of that incision, just as the danger points in an intestinal union are at the attachments of the mesentery to the bowel. The extremeties of the uterine incision must be securely closed. Interrupted linen sutures are first placed — four to six — missing the endometrium and serous coat. A two-tier suture of catgut — I have preferred No. 2, forty-day chromacized — is then so placed as to securely *surround* the extremities of the incision, beginning at one end and ending at the same end. After tying the interrupted sutures a careful shoe-lace suture accurately approximates the peritoneal surfaces and the importance of this suture to secure a peritoneal barrier has induced me to use the finest linen thread. This method of closing the incision is the one employed by Dr. Hirst, and is an evolution of his experience. I think, however, he uses catgut.

The practical points in the technique of pubiotomy briefly summarized are: more than one saw should be in readiness. Sometimes they break. A finger in the vagina locates the lip of the Döderlein needle and guides it past the margin of the obturator foramen. An assistant, having placed a metal catheter in the bladder forcibly draws the urethra and neck of the bladder away from the line of the needle and later the saw. He also forcibly drags the labium away from the tip of the needle and the puncture of the skin is then made far away from the vulva and toward the thigh. The vulva is then held until the sawing is completed and the saw has been removed. A finger in the vagina makes the proper line of the saw until a groove has been cut. During the sawing movements, to avoid breaking the saw, the two halves should approach being in a straight line, i.e., not parallel to each other. Complete severance of the bone must be assured by exploring with a finger in the incision.

The slight hæmorrhage from the cut ends of the bone is controlled by a gauze plug. The soft parts must be dilated or readily dilatable before extracting with the forceps.

During traction, counter pressure upon the hips by assistants should be used. The patient should not be placed in the Walcher position.

Careful, deliberate, skillful delivery is essential and the time consumed is directly dependent upon the dilatation of the soft parts. Rotation of occiput-posterior positions is undesirable. I prefer manual rotation of the occiput at the brim before applying the forceps. A pelvic application of axis-traction forceps is preferred to the oblique application. The catheter should be passed after delivery, and if the urine is blood tinged a self-retaining catheter is at once placed.

A pelvic girdle is desirable, and the puerperal convalescence is more conveniently conducted by placing the patient on a canvas bed with a convenient and reinforced opening under the buttocks to facilitate cleansing, the use of the bed-pan, etc.

The technique of inducing labor may be briefly summarized:

Be sure that the bougie enters the uterus to the depth of seven or eight inches. A properly bent wire stylet gradually withdrawn as the bougie enters the uterus will accomplish this, keeping the vaginal portion of the bougie stiff while that in the uterus is flexible. If labor is not under way in twenty-four hours partial instrumental dilatation followed by the Pomeroy bag is employed. Slow distension of the vaginal compartments of this bag is necessary. Its dynamic force is tremendous and extensive laceration can follow its too hasty distension. After its expulsion, active pains, the patient in the Walcher posture should be permitted. Do not be tempted to rupture the membranes unless reasonably certain that prolapse of the cord will not occur. Delay operative delivery longer than in a labor at term, if the maternal and fœtal conditions permit this delay.

DR. MILLER: Zinke in a recent article very ably pointed out that the mortality and morbidity of obstetrics outside of hospitals is to-day exactly the same as it was years ago or in the preantiseptic period. The statistics I have given here to-night are the statistics I have gathered from recent literature where the induction of labor has been done at the homes of the patients under favorable conditions or conditions such as many a man would have to-day outside of the hospital. The mortality in a well regulated hospital should be nil or practically nil. The mortality from children born prematurely should compare very favorably with, if not better than, the mortality from children born after difficult and tedious forceps delivery or other methods.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M. D.
FREDERIC A. BESLEY, M. D.
WM. C. DANFORTH, M. D.
AIMÉ PAUL HEINECK, M. D.
FRED C. ZAPFFE, M. D.
WM. R. CUBBINS, M. D.
ARTHUR B. EUSTACE, M. D.
FREDERICK G. DYAS, M. D.
M. G. SEELIG M. D.
GEO. E. BEILBY, M. D.

Carcinoma of the Rectum. Operated by Sacral (coccygeal) Route, and Its Late Results. (Ueber sacral (Kokzygeal) operierte Mastdarmkreke und deren spät resultate). E. v. HERCZEL, *Wien. Klin. Wchnschr.*, 1909, xxii, No. 6, p. 194.

After regretting that French and English surgeons regard rectal cancer as incurable the writer stated his methods and experiences as follows:

He chooses the sacral route and never uses an abdominal artificial anus except in those cases so far advanced that any attempt to remove the mass would be useless. He regards resection much more dangerous than amputation because of the danger of separation of the sutures and resulting infection.

Of his eighty-two cases, 12 died immediately after operation, in eight of these cases the tumor was high in the rectum and in four low down. Causes of death were, 4, shock; 2, pneumonia; 1, lung embolus; 1, meningitis; 1, nephritis, and 3, sepsis.

Of his eighty-two cases 64 were operated previous to 1905, and hence have passed the three year limit suggested by Volkmann. Of these sixty-four cases the primary mortality was 8, and within the three years 15 have died, and 7 could not be followed. Therefore in this series there is a recovery of 59.7 per cent. Of his cases 21 have lived five years or more, 11, ten years or more, and 3 even fifteen years. He has seen recurrence as late as thirteen years after operation, so does not regard the limit of three or even five years as sufficiently long. C. G. GRULEE.

Some Points in the Diagnosis and Treatment of "Derangements" in the Knee Joint. BARKER. *The Practitioner*, 1909, lxxxii, No. 3.

It is impossible to give an adequate idea of the worth of this article by a short review The reader gets the impression that the author has had a large experience which he has used to splendid advantage in differentiating the conditions indicated.

According to Barker, these injuries occur at "the time of greatest physical activity" and are to be found especially often in the army and navy and artisan classes, as well as among those who play cricket, foot ball, tennis and golf.

He divides these cases into three classes: first, those where a loose body truly exists; second, where there are pendulous fringes or tags of synovial membrane long enough to be caught between the bones; and third, rheumatic nodules.

The two prominent symptoms are pain and locking. The pain is due to stretching of the ligaments. The displacement is due to the recession of the internal semilunar cartilage towards the center of the joint. The character of the pain depends upon the extent and variety of the displacement. It may be only a "pinching" pain or it may be excruciating if the cartilage is firmly caught. To distinguish this from chronic rheumatism is not easy, but the rheumatic history and roughened edges of the tibia and femur speak for rheumatism.

The symptoms due to a tag or fringe are less distinct. Pain is pinching at times, but there is no locking. In this the patient has almost continuously a sense of insecurity, while with the displaced cartilage this is only occasional.

As to treatment, he advises the strictest of antisepsis and removal of the entire loosened semilunar cartilage. After the operation the patient should not be allowed to stand for two weeks nor to allow any joint overstrain for two months, and only gradually return to ordinary exercise. C. G. GRULEE

The Typical Intercarpal Luxation - Fracture. (Ueber die typische interkarpale Luxations-fraktur.) DR. ERNST FISCHER, *Wien. Klin. Wchnschr.*, 1909, xxii, No. 6, p. 203.

According to Fischer this fracture consists in the "volar luxation of the os lunatum and the proximal portion of os naviculare which is broken in two pieces."

He reports a case of this injury to both wrists and states that there is only one other case of the double intercarpal luxation-fracture on record. His case was complicated by fracture of the base of the skull and other fractures.

The prognosis is not good since the joint is often left stiff and the tendons are frequently involved. In treatment, long immobilization should be avoided.

C. G. GRULEE.

A Preliminary Report on the Administration of Ether Per Rectum. FREDERIC A. BESLEY, M. D., AND JAMES F. CHURCHILL, M. D. *Quarterly Bulletin of Northwestern University Medical School,* March, 1909.

The authors present a brief report on their experience with rectal anæsthesia, including a description of their apparatus and technique.

They consider this method of anæsthesia indicated in two classes of cases. First, those cases in which the administration by inhalation is difficult, either on account of interference with the operator or on account of the danger of infection of the field of operation. This class includes all operations about the head and neck. The second class includes those cases in which it is desirable to avoid the bronchial and pulmonary irritation caused by ether inhalation. They have found that it cannot be used in abdominal work, with the exception of gall-bladder operations.

The apparatus (of which a sketch is shown) is very simple and is described as follows: An eight ounce bottle is fitted with a two hole stopper. Though one hole is passed a bent, glass tube, the inner end of which reaches to the bottom of the bottle. A second right-angle glass tube is passed through the other opening, the inner end reaching only just within the bottle. To the first tube is attached a cautery bulb, to the second, a short piece of rubber tubing, which in turn fits onto a T tube. The second arm of the T tube connects with the rectal tube, while the third outlet is closed by a rubber tube and pinch cock.

The majority of the cases reported were anæsthetized by the usual inhalation method, the substitution being made after the patient was asleep.

A number of cases were anæsthetized by the rectal method, alone, the time required for this varying from fifteen to twenty minutes.

The technique employed is as follows: the ether bottle is placed in a vessel containing water of a temperature just under 37°. Air is pumped through the ether and into the bowel, carrying the vaporized ether with it. When the colon is felt to balloon, the pumping is stopped. After three to five minutes the outlet tube is opened, allowing the air to escape from the bowel. The pinch cock is then replaced and the procedure repeated.

The authors state that, barring faults in technique on the part of the anæsthetist or incomplete preparation of the patient, this method of anæsthesia has been satisfactory in all cases, both as regards degree of anæsthesia and after-effects. One case of their series had slight rectal irritation and passed a small amount of blood twenty hours after operation. The authors are inclined to attribute this to the abrasion of some hemorrhoids which the patient had. Post-anæsthetic vomiting is believed to be decreased.

The time of operating on these cases ranged from thirteen minutes to one and three-quarter hours.

Special emphasis is made of the following points, as essentials to the success of the method:

1. Preparation by thorough emptying of the bowel by means of catharsis and enemata.

2. Ether entering the bowel must be in the form of vapor.

3. A certain amount of distention of the bowel by air and ether vapor is necessary (great care being taken to avoid over-distention).

4. The air must be allowed to escape freely from the bowel, at intervals.

Diagnosis of Gastric Ulcer as Tested by Operation. J. N. HALL, M. D. *American Journal of Medical Sciences,* vol. 137, No. v, p. 625.

The author reports the results of his study of 50 consecutive cases of gastric, pyloric, and duodenal ulcer, in which the diagnosis was placed beyond all doubt by the findings at operation.

He states that though the idea is wide spread that dilatation of the stomach occurs in ulcer only as a direct result of mechanical obstruction, there can be no question that in many cases, in which at operation the pylorus admits a finger freely, there is nevertheless dilatation of the stomach.

The influence of pyloric spasm from irritation of an ulcer in that region, possibly from hyperacidity alone, in the causation of such a dilatation, is most important. He believes that surgical intervention is indicated in practically all of these cases, for if the ulcer heals, a later dilatation of the stomach from a contracting scar will call for the surgeon's aid, and that in this event, the earlier the better. A. B. EUSTACE.

Value of Hæmolysis in the Diagnosis of Carcinoma. WYMAN WHITTEMORE, M. D. *Boston Medical and Surgical Journal,* January 21, 1909.

Dr. Whittemore reports the examination of 109 cases with the following results:

In 39 normal individuals, hæmolysis occurred 7 times, or 17 per cent.

In 22 cases of carcinoma, hæmolysis occurred eight times, or 36 per cent.

It occurred in 50 per cent of the cases of tuberculosis.

It also occurred in Hodgkin's disease, chronic empyema, fabes, general paresis, mæleria, and sarcoma.

From these results, at the present time hæmolysis is of no value in the diagnosis of carcinoma. Moreover, in that hæmolysis occurs in vitro, in other diseases than carcinoma, and in normal individuals, it would seem necessary to do a hæmolytic test before transfusion. This is borne out by the occurrence of two deaths following direct transfusion; one reported by Pepper and Nesbit, and the other an unpublished case.

WM. R. CUBBINS.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF OBSTETRICS

UNDER THE CHARGE OF

C. S. BACON, M. D.
HELIODOR SCHILLER, M. D.
RALPH WALDO LOBENSTINE, M. D.
C. G. GRULEE, M. D.

Concerning Convulsions in the New-Born. DR. ESCH. *Archive f. Gynækologie, band 88, heft* I.

The question of convulsions in the new-born has but seldom received the amount of attention that the importance of the subject would seem to call for. Up to the time that Esch undertook the present study the most satisfactory report had been presented in 1902 by d'Espine, at the "French Congress of Medicine." At that time he presented figures taken from several of the large obstetric clinics in Europe, which are quoted by Esch.

	No. of Children	No. with Convulsions	Died	Frequency	Death Rate Per Cent
Dr. Porak & Durante, Paris Maternite (1900–1901) ...	5078	10	6	0.19	60
Dr. Maygrier, Paris Charite (1898–1901)	2885	4	1	0.13	25
Dr. C. deRibes, Paris Hotel-Dien (1808–1001)	4321	9	5	0.18	62
Prof. Jentzer, Geneva (1899–1901)	600	2	2	0.33	100
Prof. Rapin, Lausanne (1890–1901)	2850	7	6	0.24	85

From this table, one can readily see what a high death rate exists. When the convulsions are the result of hemorrhæge, the mortality is even higher than several of the above figures would indicate.

Even in the new-born, convulsions can be divided into "functional" and "organic." There are three chief theories to explain the former (1) Changes in the cerebral circulation (anæmia and hyperanæmia. (2) The theory of exaggerated cerebral reflex centers in the early days of life. (3) The toxic or infectious origin. This may be due to products of metabolism, to bacteria or their toxines, etc. The practical point is to differentiate between the functional and the organic and to treat the case accordingly. But we should remember that in the early davs of life, the organic cases, far out-number the functional. Both a careful history of the case and a painstaking examination are necessary. The convulsions of organic origin occur both in instrumental and non-instrumental labors — in prolonged as well as in short labors. They depend upon

1. Congenital cerebral or spinal anomalies.
2. Temporary cerebral compression from a difficult labor (without cerebral hemorrhæge).
3. Congenital syphilis (occasionally).
4. Cerebral hemorrhæge.

a. Hemorrhæge above the "Tentorium cerebri" i. e. cortical hemorrhæge — ether subdural or beneath the pia mater.

b. Hemorrhæge below the Tentorium i. e. the various hemorrhæges at the base of the brain and on the surface of the cerebellum.

c. The mixed types with both supra and infratentorial hemorrhæge. The bleeding may be slight and well localized or it may be very widespread.

"Lumbar puncture" will, as a rule, confirm the diagnosis.

In the case of a moderate hemorrhæge, the child seems normal at birth, or only slightly asphyxiated. The symptoms will usually not appear until after 24–48 hours. The cases born with an extensive hemorrhæge, as a rule, present the picture of a deep asphyxia, and rarely are revived.

According to Seitz the chief differential points in the diagnosis between supra and infratentorial hemorrhæge, are these:

SUPRATENTORIAL HEMORRHÆGE

Great unrest.
Shrill crying.
Early bulging of fontanelle.
Unusually pale skin.
Often unilateral twitchings or paralysis of face, arm and leg.
Lumbar puncture shows spinal fluid but slightly tinged with blood.

INFRATENTORIAL HEMORRHÆGE

Child usually very quiet.
Early disturbances in respiration with cyanosis.
No bulging of fontanelle.
Unilateral symptoms not marked.
Symptoms of spinal irritation as opisthotonus, etc.
Lumbar puncture shows much more blood in spinal fluid.

As mentioned above, it is only after the elimination of a primarily organic origin of the convulsions that we can classify the case as of functional origin.

In the group of auto-intoxications, belong those occasional cases which present the symptoms of eclampsia, together with their mothers.

According to Ahlfeld, Schmorl, Lubarsch, Dienst et cet., these infants show the same lesions in the

liver, kidneys, heart, brain, etc., as in the case of their eclamptic mothers.

TREATMENT

1. In the case of the various intoxications, use supportive and eliminative treatment; rest; keep in darkened room; keep warm; small doses of chloral or bromides.

2. In the case of hæmorrhage, in addition to the above, lumbar puncture may relieve pressure. In many cases, a "decompression operation" is well worth trying. RALPH WALDO LOBENSTINE.

Scopolamine Morphia Narcosis in Gynæcological and Obstetrical Practice. FONYO, *Budapesti Orvosi Ujsag*, 1907, No. 45–47; *Jour. Obst. and Gyn. of the Brit. Emp.*, Oct., 1908, p. 279.

The author's deductions are based on the use of scopolamine hydrobromicum with morphia in twenty-seven cases, fifteen gynecological and twelve obstetrical. In the obstetric cases, a quarter of an hour after the injection the patients were overcome by drowsiness and a feeling of fatigue, especially pronounced when there had been very severe labor pains. The patients slept between the pains, but could easily be awakened, not then remembering what had previously happened. One or more further injections were sometimes necessary, and the insensibility increased after each injection, but never persisted through the acme of the pains. The frequency of the pains was diminished by each injection, but the intensity was not affected.

The final conclusions drawn by Fonyo are:

(1) Riedel's scopolaminum hydrobromicum with morphia in the proportion of 0.0012:0.03 grammes (and in these doses), is perfectly free from danger for a sick or parturient woman or for the child to be born, and in every case its action is uniform and safe. One may leave the patients alone after the injection without danger.

(2) Under the action of scopolamine the patient is in a peculiar stupor, the so-called scopolamin-amnesia in which she indeed can perceive but cannot appreciate or remember what takes place.

(3) Scopolamin-amnesia is well adapted for the performance of major gynecological operation; but time is required to bring on the necessary stupor, and this will be an obstacle to the use of the method in minor gynecology.

(4) The use of scopolamine in labor is only justifiable in the first stage, for it delays the labor for from half an hour to an hour and this, in the second stage, is a disadvantage, especially in cases of contracted pelvis. The frequency of the pains is diminished by scopolamine, their intensity increased. The injections do not affect the third stage.

(5) The scopolamin-morphia injections are free from danger to the child, though a certain drowsiness may be induced for the first two days after birth.

CAREY CULBERTSON.

Extraperitoneal Cæsarean Section. (Für den Extraperitonealen Kaiserschnitt.) F. FROMME, *Zentrbl. f. Gyn.*, 1908, Nr. 17.

Writing from Veit's clinic at Halle, Fromme describes a modification of Frank's technique as originally proposed for his extra-peritoneal Cæsarean section. The abdominal incision extends along the line of the linea alba from the symphysis for about twelve centimeters. This is carried through to the peritoneum. From the deepest point in the vesico-uterine fold the peritoneum is split in the median line up over the uterus, pushing it upwards and freeing it widely. These free edges are then stitched with a running suture to the edges of the parietal peritoneum, or the two edges are caught together by slender clamps. The uterus is opened longitudinally and the fœtus and placenta are removed. The uterus is repaired, then the peritoneal folds, then the fascia and skin. By this method the operator avoids raising the bladder altogether.

Fromme thinks that this operation has narrowed down the indications for the classical abdominal section. From a study of his ten cases performed after the extra-peritoneal method, he lays down definite indications for Frank's operation. Considering the Sänger operation as suitable only in absolutely clean or unexamined cases, the newer method, on the contrary, may be applied in cases where repeated examinations have been made, even unclean ones, or in cases of actual infection. He thinks also that by this method operations for enlarging the pelvis will be supplanted in cases of primiparæ where the head does not eventually engage in spite of active uterine contractions and complete dilatation of the cervix and where expeditious delivery is indicated for the sake of the mother or child. Threatened rupture of the uterus, neglected transverse positions, or impediments obstructing the genital canal, the child remaining alive in each case, would furnish other rare indications for the method thus advocated. CAREY CULBERTSON.

BOOK REVIEWS

THE TECHNIQUE OF OPERATIONS UPON THE INTESTINES AND STOMACH. 180 illustrations, some of them in colors. By Alfred H. Gould, M. D., Boston. Philadelphia: W. B. Saunders Company, 1906.

This book is essentially what it purports to be — a book on technique. The author says:

"Three years ago I began an experimental study of gastrointestinal technique. The animals used for the experiments were mainly dogs, although cats were employed for certain operations.

"The object of the experiments was to simplify, where possible, the best gastrointestinal operations. After careful study of an operation upon animals, the method was tried again upon the cadaver, for anatomical corrections.

"In this book, which is the result of three years of research, are collected certain of the standard operations upon the intestines and the stomach.

"No pretence is made of giving all of the methods in vogue, and many well-known operations have been omitted to give more room for illustrating the methods which were chosen. It is believed, however, that a knowledge of the technique, here included, will enable the surgeon to meet practically all of the requirements of gastrointestinal surgery."

The book will prove of value to the student in technique, and naturally such to those engaged in pioneer work in intestinal and stomach operations. To the matured surgeon it is merely a clear mirror of methods already familiar to him.

The author has made no attempt to rearrange the ideas of others. When he quotes, he quotes literally and exclusively. This is more satisfactory to the reader, than to receive the matter at second hand, although the book may lose thereby something in the way of uniformity of style. The book is practical, rather than literary. The same operation is not described many times in order to make complete a given chapter, but the reader is referred to the one description, should the same maneuver figure in a second or third place. This gives brevity at the expense of perfect continuity. It is a good book, bearing the earmarks of having been written by a conscientious worker with a scientific mind, who is in the habit of dealing with practical facts stripped of extraneous matter and who does his work well without loss of time.

The publication is artistically and technically well illustrated with new drawings throughout by Miss Florence Byrnes and Mr. H. F. Aitken. This gives a pleasing and uniform appearance to the book, which is so often missed in publications on medicine. From the bookmaker's standpoint, the publishers, W. B. Saunders Company, have done their usual satisfactory work, and present a handsome volume. FRANKLIN H. MARTIN.

AN INDEX OF TREATMENT. By Various Writers Edited by Robert Hutchison, M. D., F. R. C. P., H. Stansfield Collier, F. R. C. S., and Warren Coleman, M. D. New York: William Wood and Company, 1908.

This work is intended to provide the practitioner with a complete guide to treatment, in moderate compass, and in a form convenient for reference. It is an octavo volume of 1867 pages of closely printed matter, profusely but not elaborately illustrated. The names of the contributors, numbering seventy-one in all, with their subjects, cover six pages of the volume.

PRACTICAL DIETETICS. With Reference to Diet in Disease. By Alida F. Pattee. New York: A. F. Pattee, 1909.

The success of this work on dietetics, having already run a course of five editions, is undoubtedly due to a great extent to the fact that the authoress believes that the preparation of food is a science as well as an art, the chemistry of which is as precise as the chemistry of the laboratory. When we are willing to be as careful in this work as we are in chemical experiments our success will become a certainty. In no other work will so little technical knowledge go so far toward simplifying that which is complicated and help us to accomplish the result which is all science, viz., adding to the comfort and attractiveness of the human race.

A TEXT-BOOK ON DISEASES OF THE NOSE AND THROAT. By D. Braden Kyle, A. M., M. D., Professor of Laryngology and Rhinology, Jefferson Medical College. Philadelphia: W. B. Saunders Co.

This work represents the fourth edition of one of the most comprehensive books on diseases of

the nose and throat published in recent years. It recommends itself particularly to the rhinologist and laryngologist for its painstaking presentation of the pathology of these affections. To the student, as well as the practitioner and specialist, its very elaborate classification and nomenclature will be of great assistance in obtaining a better understanding of the various forms of varieties of disease that affect these regions. The classification employed by the author is to some unnecessarily numerous, and therefore it may appear to confuse. As far as actual disease processes are concerned, this is true, because the simpler classification will always contribute to an easier understanding, but, as arranged by the author, his classification can be applied to a better understanding of the different phases, forms, and varieties of the commonly recognized diseases in these localities.

In the presentation of this latest edition, the author has fully revised the subject matter so as to include every distinct advance made in this specialty in recent years. O. J. STEIN.

MANUAL OF SURGERY. By Francis T. Stewart, M. D., Professor of Surgery, Philadelphia Polyclinic; Associate in Surgery, Jefferson Medical College. Philadelphia: P. Blakiston's Son & Co.

A manual of over 700 pages prepared for students and physicians, with 504 illustrations emphasizing the more important points. It gives a clear and concise description of matter usually covered in a manual of this size. The historical and bibliographical references have been omitted and emphasis laid on the details to be of greatest clinical importance. All told there are thirty-one chapters, the one an anæsthetics, both general and local, being especially worthy of mention.

CONTRIBUTIONS TO THE STUDY OF THE EARLY DEVELOPMENT AND IMBEDDING OF THE HUMAN OVUM.

1. AN EARLY OVUM IMBEDDED IN THE DECIDUA. By Thomas H. Bryce, M. A., M. D., Lecturer in Anatomy, University of Glasgow, and John H. Teacher, M. A., M. D., Lecturer on Pathological Histology, University of Glasgow.

2. AN EARLY OVARIAN PREGNANCY. By Thomas H. Bryce, John H. Teacher, and John W. Munro Kerr, M. B., Obstetric Physician to the Maternity Hospital and Gynecologist to the Western Hospital, Glasgow. Glasgow: James Maclehose and Sons.

The volume at hand is made up of two monographs, both dealing with the subject of the implantation and early development of the human ovum; the first being a very early case of uterine, the second, a case of ovarian, pregnancy.

I. An early ovum imbedded in the decidua.

The specimen was found in a mass of blood clot, which had been expelled from the uterus of a woman who was thought at the time to be aborting. The material had been sent to the laboratory for examination, and the ovum was unexpectedly found.

The data as to coitus and menstruation are very exact in this case, so that the age of the specimen can be computed to an unusual degree of certainty.

The authors consider the possible limits of the age of the ovum to be 12 and 15 days; the actual age being more likely 13 or 14 days. This is probably the youngest ovum yet described, being apparently somewhat smaller and at an earlier stage of development than Peter ovum, which has been accepted as the youngest ovum previously described.

Incidentally, it is shown that Peter's reckoning of the age of his ovum as 3 or 4 days, was clearly a great underestimate.

The specimen described consisted of a portion of the uterine decidua in which the ovum was completely imbedded.

Serial sections were made of the nodule. A number of very excellent drawings are presented of the gross specimen and of sections under low power. In addition, there are eight plates, five in colors, showing the relations of the blastocyst to the decidua and the histological relations and characteristics of the trophoblast, the embryonic vesicle, and the decidua.

The process of the imbedding of the ovum, the formation of the blastocyst, and the very early stages in the development of the embryo are discussed at length. Eleven other early ova are described and compared.

II. An early ovarian pregnancy. The specimen here described is an ovarian pregnancy, 14 to 22 days old, which was removed by Dr. Kerr at operation, following signs of rupture. It was found that the implantation sac had ruptured, but, fortunately, the relations of the various structures were retained. A number of drawings are given. The subject of ovarian pregnancy is carefully reviewed. The authors point out that their specimen proves conclusively that the plasmodium of the trophoblast is of embryonic origin and not derived from maternal epithelium as has been maintained by many investigators. They show also that there is no decidua in their specimen — another addition to the evidence on that disputed point.

The authors deserve great credit for the labor and care they have taken in bringing out these truly beautiful monographs. They are distinct con-

tributions to scientific knowledge on some of the obscure steps in the development of the human ovum, and will certainly be regarded as classics on that subject for some time to come. The high grade of the mechanical work and the profuse illustration, by colored plates and photographs, have rendered the cost of the production very great — a portion of which expense has been borne by the Carnegie Trust to Scottish Universities.

DIE ENTWICKLUNG UND FORM DES FŒTALEN BECKENS. By Dr. Edmund Falk, of Berlin. Berlin: S. Karger. 1908.

The subject of the development of fœtal pelves has long been of great interest to Falk, and as early as 1901 he published a most interesting article on this subject in the Landau Festschrift, which was based on the really exhaustive study of sixty-three specimens from the first half of pregnancy. The present monograph is based upon the elaborate study of 110 cases from the eighth week of fœtal life full term, and of course includes the material considered in the previous report. The method of preparation of his material is the same as formerly used, i. e., the earlier specimens being prepared without attempt at dissection and after clearing in xylol, while the older ones were either dissected or subjected to the X-ray and radiographs thus obtained. The age of the embryo was calculated by Hecker's rule of length, and the fœtuses of the later months were classed according to size, as the author did not have the opportunity of controlling the estimated age by checking off the clinical history of the case.

The author has carefully studied the development of the fœtal pelvis from the first appearance of the rudimentary bones until its development in the final fœtal type, and has carefully considered the influence of sex; the various factors that influence the form of the fœtal pelvis; the normal type, as well as the various pathological pelves that exist in uterine life. As a result of his extended investigation, he concludes that all the characteristic properties of form noted in the new-born are indicated by the end of the first half of gestation. He also shows that the female fœtal pelvis has a larger outlet than the male, and that this is already present at the sixth month. The proportion between the height and breadth of the pelves in both sexes is approximately the same, and the height is always greater than the breadth. Although the high position of the promontory is characteristic of the fœtal pelvis, the author shows that it begins to descend during fœtal life, and the sacrum gradually becomes more curved. This is of the greatest interest as it shows no support for the theory of Meyer and Litzman, which up to this time has enjoyed almost universal vogue, which ascribes the descent of the sacrum and the lower position of the promontory to the effect of the body weight. The monograph clearly shows that we are forced to alter many of the prevailing theories as to the causation of many of the pelvic deformities which are now almost universally accepted. For a considerable length of time this suspicion has gradually been growing among men who have made studies upon the pelvis during fœtal life. The author clearly shows that the majority of pelvic deformities are foreshadowed during fœtal life, and are due to disturbances in the rate and energy of growth in the various centers, rather than to the mechanical causes to which they have generally been attributed, such as the effect of the body weight, traction of the muscles, etc. Flat, transversely narrowed, round, chondrodystrophic, and assimilation pelves are considered, the latter two being classed under disturbances of the ossification centers. The article is well illustrated by a series of plates showing X-rays and actual dissections. The monograph is most interesting and convincing, and is of the greatest value in the elucidation of many mooted questions in the important study of deformed pelves.

F. M. LYNCH.

GEBURTSHÜLFLICHER RÖNTGEN-ATLAS. Herausgegeben, von Prof. Dr. Med. G. Leopold und Dr. Med. Theod. Leisewitz. Dresden: Zahn and Jaensch. 1908.

This instructive atlas is divided into ten parts of ten pictures each. The descriptive text is in three languages, German, French, and English. It should be of especial value to teachers of obstetrics. The first part shows a variety of subjects, including pubiotomy; a child's head in the pelvis during labor; an injected arterial vessel system in a nine-months' fœtus; fractures in the new-born, etc. This variation does not permit of the pictures becoming tedious and therefore will be of undoubted value to anyone interested in medical science.

GIBSON.

MATERNITY. By Henry D. Fry, M. D., S. D. New York and Washington: The Neale Publishing Company.

This is a book for the lay reader, the medical student, and the trained nurse. Beginning with a historical sketch of child-bearing, which is followed by a chapter upon hygiene of girlhood, and ending with the care of the infant and infant-feeding, we have as nearly an ideal book to be placed in the hands of those for whom it is in-

tended as it is possible to get. It takes up all the subjects pertaining to pregnancy, childbirth, and the puerperium. It considers the pathology of pregnancy which the patient herself should know, but does not contain the gravest pathology of pregnancy or labor. It is not necessary for an expectant mother to know the difficulties which frequently are met with in labor, and the writer has wisely avoided any allusion to them.

CHAS. E. PADDOCK.

SURGICAL DISEASES OF CHILDREN. By Samuel W. Kelly, M. D., Professor of Diseases of Children, Cleveland College of Physicians and Surgeons, Medical Department, Ohio Wesleyan University. New York: E. B. Treat & Co., 1909.

This treatise of 738 pages with 293 illustrations is devoted exclusively to surgical diseases of children, and by the brief history of the subject as given in the preface it is the first work dealing exclusively with surgical pediatrics by an American author to appear.

The prefatory pages, for the most part historical, being the development of the specialty down to the present time, showing that it has advanced more slowly than medical pediatrics, also more slowly than other specialties of medicine and surgery.

The book is clearly and concisely written, taking up each subject in a methodical and comprehensive manner, and dealing not only with major pathological conditions but with minor ones as well.

HERBERT A. POTTS.

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